ELECTRICAL ENGINEERING

JULY 1945

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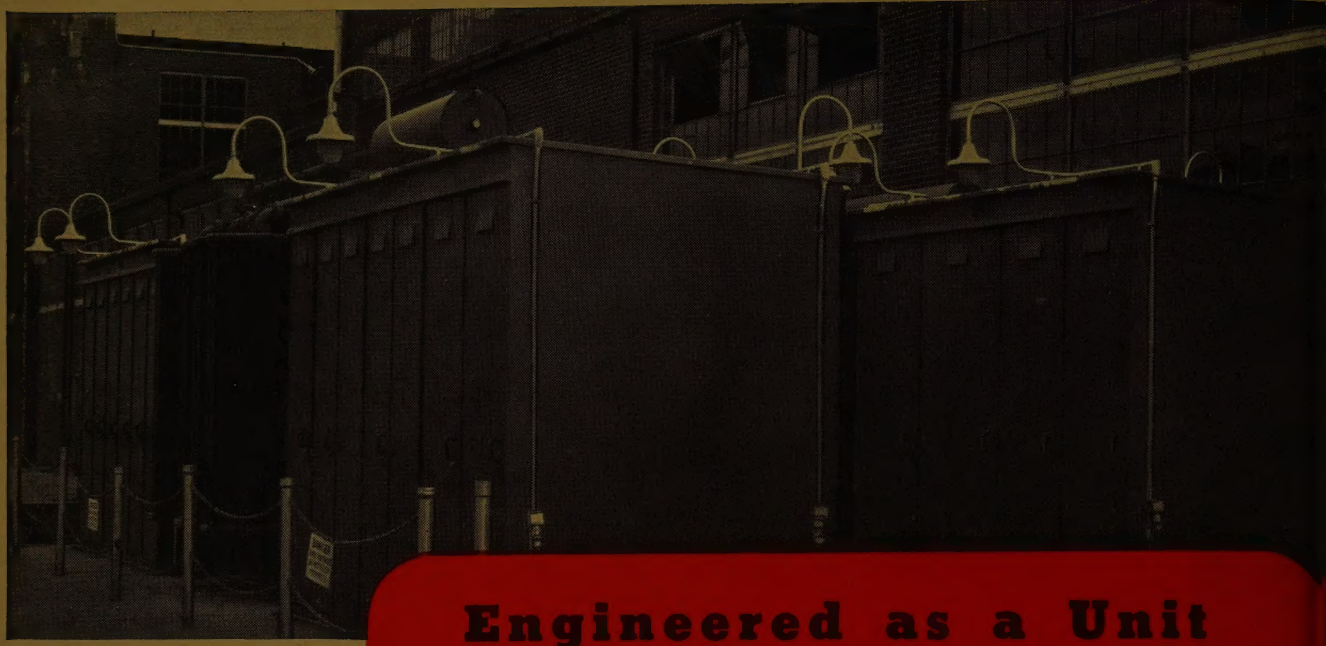

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JULY
1945

The Cover: Welders seal the joints of a turbogenerator frame. In the foreground is a circular frame designed for a 4,500-horsepower electric motor. Westinghouse photo

TRANSACTIONS SECTION

(Follows EE page 282; a preprint of pages 495-550 of the 1945 volume. Any discussion of these papers will appear in the December 1945 "Supplement to Electrical Engineering—Transactions Section" and in the 1945 volume.)

Statements and opinions given in articles and papers appearing in *Electrical Engineering* are the expressions of contributors, for which the Institute assumes no responsibility. ¶ Correspondence is invited on all controversial matters.

Published Monthly by the

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Founded 1884

VOLUME 64
NUMBER 7

ALCO has been awarded for the fifth time the Army-Navy "E" Award for continued excellence in quantity and quality of essential war production.

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MECHANICAL AND ELECTRICAL PROPERTIES OF ALSIMAG CERAMICS

ITEM	A.S.T.M. TEST NUMBER	UNIT	STEATITE				
			ALSIMAG A-35	ALSIMAG A-196	ALSIMAG 197	ALSIMAG 211	ALSIMAG 243
Specific Gravity	———	———	2.5	2.6	2.6	2.7	2.8
Density	———	lbs. per cu. in.	.090	.094	.094	.098	.101
Volume	———	cu. in. per lb.	11.11	10.64	10.65	10.26	9.91
Water Absorption	D116-42(A)	%	0—.05	0—.05	0—1	.08	0—.05
Color	———	———	White	White	White	White	Buff
Softening Temperature	C24-35	°C. °F.	1 450 2 642	1 440 2 624	1 445 2 633	1 400 2 552	1 440 2 624
Resistance to Heat (Safe Limit for Constant Temperature)	———	°C. °F.	1 000 1 832	1 000 1 832	1 000 1 832	1 000 1 832	1 000 1 832
Hardness	———	Mohs' Scale	7.5	7.5	7.5	7.5	7.5
Linear Coefficient of Thermal Expansion 25-100°C. 25-600°C.	——— ———	Per °C.	6.9×10^{-6} 8.7×10^{-6}	7.3×10^{-6} 8.9×10^{-6}	7.7×10^{-6} 10.4×10^{-6}	7.3×10^{-6} 9.2×10^{-6}	9.1×10^{-6} 10.4×10^{-6}
Tensile Strength	D116-42	lbs. per sq. in.	8 500	10 000	8 500	7 500	———
Compressive Strength	D667-42T	lbs. per sq. in.	75 000	85 000	75 000	65 000	85 000
Flexural Strength	D667-42T	lbs. per sq. in.	18 000	20 000	20 000	18 000	20 000
Resistance to Impact (½" rod)	Charpy D667-42T	inch-lbs.	4.5	5	1.8	2.0	———
Thermal Conductivity (Approximate Values)	———	cal./sec./cm. per °C.	.006	.006	.006	.006	.008
Dielectric Strength (step 60 cycles) Test discs ¼" thick	D667-42T	volts per mil	225	240	210	240	240
Volume Resistivity at Various Temperatures 25°C. 77°F.	———	Ohms per Centimeter Cube	$>10^{14}$	$>10^{14}$	$>10^{14}$	$>10^{14}$	$>10^{14}$
100°C. 212°F.			2.1×10^{12}	1×10^{13}	8.1×10^{13}	$>10^{14}$	5.0×10^{13}
300°C. 572°F.			6.0×10^{7}	1.8×10^{9}	2.5×10^{10}	9.0×10^{12}	7.0×10^{11}
500°C. 932°F.			3.2×10^{5}	9.0×10^{6}	8.8×10^{7}	3.5×10^{10}	1.2×10^{10}
700°C. 1 292°F.			2.3×10^{4}	5.0×10^{5}	4.2×10^{6}	4.8×10^{8}	1.0×10^{9}
900°C. 1 652°F.			7.0×10^{3}	7.0×10^{4}	6.8×10^{5}	2.5×10^{7}	3.0×10^{6}
Te Value	———	°C. °F.	440 824	640 1 184	840 1 544	> 1 000 > 1 832	> 1 000 > 1 832
Dielectric Constant 60 Cycles	D667-42T	———	6.1	5.9	6.3	———	6.3
Dielectric Constant 1 000 K. C.			5.9	5.8	6.0	5.8	6.2
Dielectric Constant 10 M. C.			5.8	5.7	5.8	5.7	6.2
Power Factor 60 Cycles	D667-42T	———	.015	.0022	.0020	———	.0014
Power Factor 1 000 K. C.			.0035	.0021	.0012	.0004	.0004
Power Factor 10 M. C.			.0030	.0015	.0010	.0003	.00035
Loss Factor 60 Cycles	D667-42T	———	.09	.013	.0126	———	.0088
Loss Factor 1 000 K. C.			.021	.012	.0072	.0023	.0025
Loss Factor 10 M. C.			.017	.008	.0058	.0017	.0022
Capacity Change Per °C.	———	parts per million	+160	+160	+160	+120	+130

ELECTRICAL ENGINEERING
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AIEE Report on Collective Bargaining

After careful inquiry into present membership practices of unions and prevailing Government attitudes and policy, an AIEE committee has prepared this comprehensive report considering all the implications of the engineer's bargaining position in industry. The report recommends preparation of a factual manual on the American labor movement and establishment of a continuing committee on collective bargaining. Sponsorship of any collective-bargaining agency by the Institute or any of its Sections is disapproved, though the possibility of the AIEE's occasional intervention in disputes as a friend of the court in behalf of its members is recognized.

THE LAST 15 YEARS have witnessed substantial changes in employee–employer relationships. Of the many forces that have accounted for these changes, the most important are

1. The great depression which developed a strong urge for security on the part of wage earners.

2. Social legislation designed to bring about a better distribution of national income and to provide greater security for workers through the establishment of minimum labor standards, various types of social insurances, as well as by the encouragement of labor organizations and collective bargaining.

3. The growth in the membership and power of organized labor, especially in the mass-production industries.

4. The split in the American labor movement.

5. The shortage of man power occasioned by World War II and the controls introduced by unions and the Federal Government affecting this shortage.

Until very recent years the great majority of employees have dealt as individuals with their employers in establishing wages, hours, and conditions of employment. In 1929—one of our most prosperous peacetime years—the membership of organized labor totaled approximately 3,500,000 workers. As the depression set in, union membership slowly but steadily declined to under 3,000,000. In 1933 the labor movement surged forward aided by improved business conditions but more especially by the National Industrial Recovery Act and later by the National Labor Relations Act and the policies carried out by the National Labor Relations Board and by the National War Labor Board. Today labor organizations, according to various estimates, have a membership of between 12,000,000 and 13,000,000, and the wage contracts negotiated by them probably apply to an additional 3,000,000 or 4,000,000.

The character of the American labor movement has undergone considerable change during these years. This change has been accentuated by the existence of two competing national federations (the American Federation of Labor and the Congress of Industrial Organizations), the United Mine Workers of America, and the Confederated Unions of America. The last-mentioned organization is an association of independent unions. To retain or to win leadership in the field each of these organizations has found it necessary to expand its jurisdiction and increase its membership. The movement, which had been largely one of production workers, rapidly spread to clerical employees. Later the drive was broadened to include professional employees.

It was the pressure to bring engineers into heterogeneous unions comprising professional and nonprofessional employees which are affiliated with the AFL or the CIO that led to the appointment of the AIEE committee on collective bargaining and related matters.

A report prepared by the AIEE committee on collective bargaining and related matters: I. Melville Stein, *chairman;* E. P. Yerkes, *secretary;* O. W. Eshbach; W. R. Hough; A. C. Streamer; and B. Van Ness, Jr.

The AIEE committee on collective bargaining and related matters was very fortunate in obtaining the consulting services of Waldo E. Fisher, professor of industrial relations at the Wharton School, University of Pennsylvania. A student of industrial relations for over a quarter of a century and author of many books, reports, and papers relating to that subject, Doctor Fisher has served Government, society, and industry in many important assignments of which the following few are representative: consultant to National War Labor Board, member of staff of International Labor Office, past president Philadelphia Industrial Relations Association.

On Doctor Fisher's recommendation and through his co-operation, the committee has conferred with William M. Leiserson. In introducing a recent article by Doctor Leiserson in *The American Magazine*, the editor made the following statement: "Doctor Leiserson has perhaps the most impartial and comprehensive view of labor problems of any man in America. In the last 35 years he has served as a mediator and arbitrator of labor disputes in many industries. He has made studies of labor problems for cities, states, and the National Government. In addition to being chairman of the National Mediation Board, he has served as chairman of the National Petroleum Labor Policy Board, member of the National Labor Relations Board, and chairman of the National Railway Labor Panel. He is now visiting professor of economics at Johns Hopkins University."

STATEMENT OF THE PROBLEM

To clarify its own thinking the committee has defined the problem which the Institute has placed before it as follows:

Should the American Institute of Electrical Engineers take any action with respect to the determined efforts of unions of professional and nonprofessional workers to organize and sometimes to compel professional employees, including electrical engineers, to join their associations for collective bargaining, mutual aid, and other purposes? If so, what action should be taken?

The National Labor Relations Act guarantees employees the right to organize and bargain collectively and forbids employers to interfere with self-organization or to refuse to bargain with certified groups of employees. There always will be some employers who, unless restrained, will disregard the rights and legitimate wants of their workers, and severe competition within industry may occasion reductions in labor standards which progressive and socially minded employers deplore. Also drastic curtailments in business activity give rise to unemployment, loss of earnings, and sometimes unfair terms and conditions of work. It is for these and other reasons that employees have been guaranteed protection in the exercise of their rights to form unions and to negotiate wage contracts. The voluntary exercise of these rights cannot be denied in a free society. However, the National Labor Relations Act does not compel anyone to join a union. On the other hand, the Act does not prevent employers and employees from entering into closed-shop or union-shop agreements which, as a condition of employment, require membership in a particular union.

Many engineers believe that the inclusion of professional employees in an organization of both professional and non-

Collective Bargaining and the Professional Employee

In January 1944 the board of directors of the AIEE authorized the appointment of a committee to study and report on collective bargaining and related matters. At about the same time some discussions were started leading to the establishment in July 1944 of a joint committee of three of the professional engineering societies. This committee's function is also that of a study or survey group, and it became the Joint Committee on the Economic Status of the Engineer. The three societies participating in the joint activity are the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the AIEE. The American Institute of Mining and Metallurgical Engineers and the American Institute of Chemical Engineers have been invited to participate in the work of the joint committee, and, pending formal action on the part of these two societies, their representatives have been participating informally.

The scope of the survey work being undertaken by the joint committee is considerably broader than the subject of collective bargaining, but one of the survey groups set up by the joint committee is a committee on collective bargaining by engineers in professional work.

The recommendations of the report of the AIEE committee on collective bargaining and related matters were approved tentatively by the AIEE board of directors at its meeting on May 29, 1945, pending further consideration by the membership as a whole, and the report, including its recommendations on policy, now is being studied by the Joint Committee on the Economic Status of the Engineer.

To facilitate the co-operative work of the Joint Committee on the Economic Status of the Engineer, that committee has recommended that the tentative report of the AIEE committee on collective bargaining and related matters be published promptly not only in *Electrical Engineering*, but also in the monthly publications of the other professional engineering societies. This is intended to give the joint committee the benefit of the comments and criticism of all engineers doing professional work rather than only those of readers of *Electrical Engineering*.

Your criticism and comments are earnestly solicited. These should be sent promptly to:

Mr. E. P. Yerkes
Bell Telephone Company of Pennsylvania
1835 Arch Street
Philadelphia 3, Pa.

In writing please indicate the professional engineering society or societies to which you belong.

professional employees in which the nonprofessional workers constitute the majority would not give engineers adequate protection, inasmuch as their wages and conditions would be negotiated by leaders elected and maintained in power by nonprofessional workers whose interests would have to come first and whose demands might be satisfied at the expense of the professional employees. The interests of nonprofessional employees and of professional employees in many respects are not similar. Because of their education and training, and their genuine concern with the effective utilization of labor, materials, machines, and natural forces, as well as their obligations under their codes of professional conduct, the engineers may prefer to unite to formulate their own objectives, policies, and methods and to negotiate their wages and terms of employment.

The committee is of the opinion that the Institute should make it a matter of record that it is not opposed to labor organizations nor to collective bargaining, so long as the goals of labor organizations do not run contrary to the law or conflict with the best interests of the engineering profession. It believes that the professional engineering societies should have but one concern with labor organizations or unions, namely, to see that professional employees are not compelled to join labor organizations, especially when such organizations are dominated or controlled by nonprofessional employees, and are not forced into bargaining units dominated or controlled by nonprofessional employees.

The law does not require anyone to join a labor organization. Direct compulsion may occur in only one way, namely, when a union-shop or closed-shop contract is put into effect. (For definition of various types of union-security arrangements see Appendix I.) The foregoing types of union–employer relationships in the great majority of cases are established through collective bargaining. In only one case has a Federal agency been willing to urge the closed or union shop on an employer, and that was in June 1941, when the National Defense Mediation Board recommended, with but one dissenting vote, that the Bethlehem Steel Corporation accept a master agreement providing for a closed shop which had been submitted to the company by the union representatives of the shipbuilding employees on the Pacific Coast. Several months later, the same Board refused to order the steel companies to grant the union shop to the United Mine Workers of America for its members employed in coal mines operated by these companies. The latter decision brought about the Board's demise.

The National Labor Relations Board has no authority under the National Labor Relations Act to order the introduction of a closed or union shop. The National War Labor Board, presumably in return for the no-strike pledge, has ordered maintenance-of-membership clauses to be em-

died in wage contracts and has ordered renewal of a closed- or union-shop use during the negotiation of a new contract. It has not, however, ordered the option of either a closed or a union shop ere these types were not in effect in the piring contract.

Under closed-shop or union-shop contracts covering all employees in the barining unit, professional employees with supervisory responsibilities could be mpelled to join a labor organization ich might be dominated by nonprofesnal employees. Such compulsion could ppen under maintenance-of-membership contracts, only if professional employees were members of the labor organition and failed to exercise their option resign during the 15-day period set aside this purpose.

Indirect compulsion, however, may occur in other ways. Professional employees ay be forced into unions of nonprofesonal workers by pressure applied by ion members. Redress from physical rce and threats does not fall within the risdiction of the National Labor Relaons Board but is a matter that must be ken up with the courts. Also, indirect mpulsion takes place when the National abor Relations Board makes a decision hich, because of the absence of a qualified oup of professional employees, brings ofessional employees into a bargaining it composed primarily of nonprofessional nployees. In this case there is direct mpulsion with reference to placing prossional employees in a *bargaining unit* mposed primarily of nonprofessional emloyees, but there is no direct compulsion join the *organization* of nonprofessional nployees which is recognized as the *barining agent*. However, to avoid ill feelng between the professional employees nd their bargaining agent and to take adantage of the only opportunity to be repsented in the negotiations covering the rms of their employment, the professional nployees might find it necessary to join ne organization controlled by nonprofesonal employees.

To protect themselves against either irect or indirect compulsion, engineers nay find that their best defense is an organiation either of engineering employees, r of engineering and other professional nployees, associated with or independent f a national federation of labor.

It is the committee's considered opinion hat engineers, guided by their personal onvictions and the circumstances in which hey find themselves, should decide for hemselves whether they wish:

. To join a union associated with one of the ational federations of labor which may be ither a union of professional employees only r a union of both professional and nonpro-ssional employees.

. To join with other professional employees or the purpose of forming an independent rganization composed exclusively of engineers or of engineers and other professional employees.

3. To refrain from joining any labor organization.

Except in cases involving closed-shop or union-shop contracts, the engineer's right to make his own choice is guaranteed by the National Labor Relations Act.

The committee believes that electrical engineers should be fully informed as to their rights and opportunities under the National Labor Relations Act but that their choice of a bargaining agency should not be influenced by the Institute, beyond its indicating to them that, in the interest of their professional status, it would be undesirable for them to belong to, or to be represented by, a labor organization dominated or controlled by nonprofessional employees.

POSSIBLE COURSES OF ACTION TO BE TAKEN BY THE INSTITUTE

Five courses of action suggest themselves to the committee. The Institute may:

1. Do nothing.

2. Study the situation and prepare a manual for the individual members, setting forth what the Institute and similar organizations may and may not do and indicating clearly what courses of action are open to individuals or groups.

3. Set up machinery within the engineering societies which will enable them to intervene as a friend of the court for the purpose of assisting engineers engaged in engineering work of a professional nature to remain outside of bargaining groups of nonprofessional men, or to exercise their right to bargain collectively through representatives of their own choosing.

4. Attempt to set up professional organizations through the Institute or its Sections, as collective-bargaining agencies for professional men.

5. Attempt to secure a modification of the Wagner Act which would either:

(*a*). Exempt engineers from the provisions of the Act

or

(*b*). Put professional employees in a separate category under the Act.

The committee believes that the AIEE would fall short of fulfilling its obligations to its members if it were to do nothing at all. While the Institute is interested primarily in increasing scientific and technical knowledge in the field of engineering, it cannot ignore the impact of political and social changes in our national economy upon the engineering profession. The recent developments in the field of industrial relations fall into this category.

The committee also believes that some action is necessary to ensure the maintenance of a high professional standing among engineers in conformance with the objectives stated in the AIEE constitution:

Its objects shall be the advancement of the theory and practice of electrical engineering and of the allied arts and sciences and the maintenance of a high professional standing among its members.

On the other hand, the course of action listed as 5(*a*) has little to offer as a solution of the problem facing engineers. Those close to the situation in Washington hold that efforts to exempt engineers from the provisions of the National Labor Relations Act have very little chance of success. The Act applies to all employees including doctors, lawyers, and other professional employees, working in establishments engaged in or affecting interstate commerce. It would be difficult to justify exemption for engineers as a group, especially since many engineers undoubtedly would protest such action. It also has been pointed out that, even if this objective could be achieved, the problem would still remain. Unions could and probably would accept engineers as members and nothing in the National Labor Relations Act would preclude such action, even if engineers were excluded from the provisions of the Act. Moreover, in those instances in which engineers believe they need a labor organization to protect their interests and the employer refuses recognition, the bargaining agency for the engineers would have to resort to strikes to obtain a wage contract, since the exclusion of engineers from the National Labor Relations Act would not permit certification by means of an election under the supervision of the National Labor Relations Board. The engineers would be in exactly the same position in which the foremen found themselves prior to a recent decision.* When the National Labor Relations Board held that it would not establish a bargaining unit for foremen and would not certify bargaining representatives for them, a wave of foremen's strikes spread throughout industry. As a result foremen through their organization, the Foremen's Association of America, have secured recognition and union agreement in certain establishments. To clarify the situation, the National Labor Relations Board found it necessary to hold a hearing in Detroit in December 1944 for the purpose of reconsidering its position on the foremen question and of deciding whether they were entitled to all the rights that other employees enjoy under the National Labor Relations Act. Lastly, the fact that engineers now have the right to join unions whenever such a course of action seems desirable gives them, as individuals, a potential bargaining power with their employers which many engineers would not want to surrender.

Through course 5(*b*), instead of attempting to have engineers in professional work excluded from the provisions of the National Labor Relations Act, the attempt

* On March 26, 1945, in a case involving the Packard Motor Car Company and the Foremen's Association of America, the Board reversed by a two to one vote its Maryland Drydock decision and granted organizations of foremen, which are unaffiliated and independent of other unions, the right to petition the Board and, where they can win an election, to be certified as the legal agen of supervisory employees in a specified bargaining unit.

might be made to modify the Act so as to place professional employees, including engineers, in a separate category under the Act. Presumably, under such modification professional employees would be considered ineligible for inclusion in bargaining units of nonprofessional employees but would still have the right under the Act to be placed in bargaining units of professional employees, if they so desired and to be represented by representatives of their own choosing. In principle, at least, such an arrangement would seem to be better than any proposed to date with reference to modification of the existing law affecting collective bargaining by professional employees. It would avoid having professional employees represented by nonprofessional employees or by representatives chosen by a group in which nonprofessional employees predominated, and yet it would not deny professional employees any rights guaranteed to other types of employees.

If requested to do so by a substantial majority of their professional employee members, the engineering societies could quite properly advocate and work for such a modification of the National Labor Relations Act. In doing so they would be following a course similar, in principle, to that sponsored by the American Federation of Labor, which has advocated an amendment to the Act providing for craft bargaining units when requested by employees in particular crafts. Naturally the outcome of such a procedure cannot be predicted, but it seems unlikely that the necessary modification of the Act could be accomplished at an early date, if at all. Meanwhile, professional employees would have no assurance that they would not be represented by representatives chosen by groups dominated or controlled by nonprofessional employees. In this connection it should be pointed out that, if professional employees, through the formation of, or affiliation with, organizations of professional employees, were assigned by the National Labor Relations Board to bargaining units composed solely or predominantly of professional employees, they would be in a no less favorable position in the event that the above modification of the National Labor Relations Act were accomplished later.

An arrangement similar to that indicated in course of action 5(*b*), but providing for a separate order-in-council and board, recently was advocated in Canada as a substitute for the present Canadian Wartime Labour Relations Act (P.C. 1003) in so far as that Act involves professional employees. The attempt was not successful but did result in a temporary modification of the procedures under the Act which apparently would assure the right of professional employees to be included in bargaining units of professional employees, even though they had been included previously in heterogeneous bargaining units or units of nonprofessional employees.

Course of action 4 would seem to be undesirable for a number of reasons. The right to bargain collectively is not an abstract right but one to be exercised in terms of specific bargaining units. To enjoy this right employees must form or join organizations which are free from employer domination and control. Section 8 of the Wagner Act specifically states that it shall be an unfair labor practice for an employer:

1. "To interfere with, restrain, or coerce employees in the exercise of the rights guaranteed in Section 7" which reads "employees shall have the right to self-organization, to form, join or assist labor organizations, to bargain collectively through representatives of their own choosing, and to engage in concerted activities, for the purpose of collective bargaining or other mutual aid or protection."

2. "To dominate or interfere with the formation or administration of any labor organization or contribute financial or other support to it . . . . ."

The committee believes that any bargaining agency for engineers or professional employees set up by the American Institute of Electrical Engineers or its Sections later might find itself handicapped at subsequent hearings before the National Labor Relations Board. Competing unions undoubtedly would challenge its status as a bona fide bargaining agency, inasmuch as it had come into existence with the help of an association whose membership and more especially its officers and directors include employing engineers and management representatives. Professional labor leaders undoubtedly would try to prove that these agencies were initiated, sponsored, assisted, and indirectly controlled by an association dominated by employers and their representatives and would demand that they be disestablished. Thus these Institute-sponsored bargaining agencies always would be in the position of having to prove to the National Labor Relations Board that they were not employer dominated.

The committee believes it would be a disservice to the individual members as well as the Institute to endorse a procedure which later might be declared to be in violation of the National Labor Relations Act or would hamper engineers in subsequent efforts to exercise their rights under that Act. The committee would like to add that, just as it considers it unwise for nonprofessional workers to dominate a minority of professional employees, so it believes it equally unwise for the Institute to take any action which might leave the impression that its members who are employers or who occupy official positions with management have any desire to impose their ideas as to organization or collective bargaining on those members of the Institute who happen to be employees.

For this reason and because the committee believes that the creation of labor organizations for collective bargaining is a function which falls outside the field of activity of the Institute, it concludes that the Institute itself or any of its Sections should refrain from sponsoring either directly or indirectly the formation of bargaining agencies for its employee members and from assisting in the formation of such organizations.

The committee believes that course of action 3 should not be followed except under unusual circumstances. It is true that professional organizations have intervened for their members as a friend of the court. It is quite possible that the National Labor Relations Board may continue to listen to their contentions in specific situations. The committee has been advised on good authority that intervention probably would not be granted to professional engineering societies, if the purpose were to help their members to keep out of a particular union or to tell the Board how engineers should be organized. The Board takes the position that a group of employees may organize in any way it sees fit as long as it keeps free from employer domination. It also maintains that elections are held not to determine whether employees want to stay out of a union but to ascertain the wishes of employees concerning a union or several unions seeking certification. Intervention may be justified in certain instances especially where the engineering members of a bona fide organization of professional employees request the Institute to intervene in their behalf. Under such circumstances the Institute would have an interest in the case, because it would be assisting certain employees involved in the case to obtain what to them is a satisfactory bargaining unit. It then could take the position that engineers or professional employees, because of their training, responsibility, nature of work, and so forth, are a homogeneous group for purposes of collective bargaining.

The committee has been informed that engineering associations, unless they can establish an interest in the case, probably would be allowed to intervene as a friend of the court only in very rare instances such as an occasion when the Board is hearing oral arguments in Washington on the record of a particular case, previously heard in the field by a trial examiner, in which the question before the Board is a difficult one involving considerations of wide public interest. A case in point was the hearing for the purpose of oral argument held in connection with foremen's unions at which a number of outside organizations were permitted to intervene and file briefs. Thereafter, the foremen's cases were handled like the ordinary run of representation cases.

It should be pointed out that intervention will have little value unless it is undertaken early in the process—certainly before the situation becomes crystallized.

In order to eliminate duplication of effort and conflicting testimony, it may be advisable for the various engineering as-

ciations to establish a joint committee hich would serve as a clearing house for ese associations and to arrange for a mmon counsel for participating associaons in those cases in which intervention is ught. Under such an arrangement each gineering association could elect to interne in any particular case with the minium of expense and wasted effort. It ould have the additional advantage of ducing to a minimum the confusion and ritation, as far as the National Labor elations Board is concerned, that unoubtedly would result from independent ction on the part of each association. his procedure would enable the Institute: a) to join with other engineering associaons, (*b*) to act alone, or (*c*) to refrain om any action, depending upon the sues and circumstances in a given case.

With reference to course of action 2, the ommittee believes that the preparation of monograph entitled "Collective Baraining and the Professional Employee" hould be prepared for the information nd guidance of members of the AIEE. he exact nature and specific content of his monograph should be given careful tudy and be prepared under the direction f a committee of the Institute. It might ell include:

1. Statement of the problem facing the professional employee.

2. The American labor movement.

(*a*). Why it came into being.

(*b*). Its aims and goals.

(*c*). Its structure: various types of local and national unions; the AFL; the CIO; other important national organizations.

(*d*). Its functions, policies, and tactics.

(*e*). The extent of organization.

3. The National Labor Relations Act (Wagner Act).

(*a*). The rights and responsibilities of professional employees under the Act.

4. Collective bargaining.

(*a*). Function.
(*b*). Subject matter.
(*c*). Techniques.

5. Courses of action open to engineers and other professional employees to protect their own interests.

Recommendations

The committee on collective bargaining and related matters recommends that the American Institute of Electrical Engineers adopt the following tentative policy:

1. Prepare a manual for members presenting the essential facts about the American Labor movement and the National Labor Relations Act (Wagner Act) and setting forth (1) what the Institute may and may not do and (2) the courses of action that are open to its members.

2. Seek the establishment of a joint committee composed of representatives of the various engineering societies which would serve as a clearing center for these associations and, in those cases in which two or more societies desire and have the right to intervene as a friend of the court on behalf of their members, make arrangements for a common counsel.

Note. The committee has been informed that the Institute generally will have little opportunity to intervene as a friend of the court in labor cases involving engineers. It believes, however, that such action may be both possible and desirable in certain circumstances. A joint committee would enable each society to join with other engineering societies, to act alone, or to refrain from any action depending upon the issues and circumstances in a given case.

3. Establish a continuing committee on collective bargaining and related matters in order that the Institute may be kept informed about new developments concerning unionization and collective bargaining.

4. Refrain from establishing collective-bargaining agencies for engineers which are directly or indirectly associated with the Institute or its Sections, and from assisting in any way in the actual formation or administration of a labor organization for engineers.

DETERMINING THE BARGAINING UNIT

The National Labor Relations Act guarantees employees the right to self-organization, that is, to form or join organizations and to bargain collectively through representatives of their own choosing. The Board has taken the position that any employee organization has complete freedom to define its membership qualifications as it sees fit, as long as it keeps free of employer domination. In other words, the composition of a labor organization, even though it includes professional workers, foremen, and employers in its membership, is of no concern to the Board, unless the organization is employer minded or employer dominated. Employer-initiated and employer-dominated unions are illegal under the Act and, therefore, have no standing before the Board.

The Board's primary concern in representation disputes is with the character of the bargaining unit. It is important to note that the bargaining unit and the membership of a union need not be coextensive and frequently are not. An employee organization need not bargain for its entire membership nor even for any of its members. It may bargain for employees entirely outside of its membership. As a matter of fact, collective bargaining for a particular group of employees may be done by an outside individual, a small committee, a union, or some other association. All that the Act requires is that the representative or representatives be of the employees own choosing and be free of employer domination.

Many of the disputes before the Board arise over the bargaining unit claimed by the representatives of the union seeking recognition.* In all representation cases the Board is required by law to decide specifically the question as to what bargaining unit is appropriate.**

Where there is only one organization involved and the organization has been designated by approximately 30 per cent of the employees in the bargaining unit, the Board will hold an election and, unless the employing company presents valid objections, certify the organization, should it win the support of the majority of the qualified employees voting. It is where two competing labor organizations claim identical or overlapping jurisdiction that the Board must decide which one shall be the bargaining agent. In doing so the Board's chief aim is to bring together in a single unit those employees who have a community of interest which is likely to further harmonious organization and facilitate the aims of collective bargaining. Conflicting claims, as well as justifications which go back over a period of years, sometimes make the determination of a bargaining unit a difficult task. The Board has found it necessary, therefore, to set up a

* The Board also handles complaint cases involving charges of employer violation of the provisions of the Act relating to unfair labor practices. These disputes, however, have no bearing on the issues under discussion.

** See Appendix I for distinction between "bargaining unit" and "bargaining agent."

number of criteria to be used as a guide in the making of a decision. These criteria may be summarized as follows:[1]

1. The history, extent, and type of organization of employees.

2. The history of collective bargaining.

3. The history, extent, and type of organization of employees in other plants of the same employer, or other employers in the same industry.

4. The skill, wages, work, and working conditions of the employees.

5. The desires of the employees.

6. The eligibility of the employees for membership in the union or unions involved.

7. The relationship between the unit or units proposed and the employer's organization, management, and operation.

8. Whether an association of separate employers is in existence exercising employer functions, and having a history of collective bargaining on a multiple-employer basis.

No precise weight is given to any of the above criteria. Generally several considerations are involved in each case. The Board holds that the complexity of the problem precludes the use of rigid rules in the determination of the unit appropriate for the purposes of collective bargaining.

Considerable weight, however, is given to the desires of employees in representation cases in which rival organizations have advanced conflicting jurisdictional claims. In such situations the Board applies the Globe doctrine—so named because the principle was first enunciated in the case of the Globe Machine and Stamping Company and the Metal Polishers Union, Local Number 3, and others. Under this doctrine the employees are permitted to decide by vote whether they want a separate craft union or desire to be included with other employees in a larger bargaining unit. If the majority of a given craft or related crafts vote for a craft union, the Board rules that the craft shall be the bargaining unit. If the majority vote for the larger bargaining unit, the Board denies separate craft representation. Incidentally, the American Federation of Labor now is advocating an amendment to the Wagner Act which would make this procedure a part of the Act.

DEFINITION OF PROFESSIONAL EMPLOYEE

Because organizations of professional employees seeking certification may find themselves facing competing unions also claiming jurisdiction of salaried employees, a definition of "professional employee" is necessary.* The distinction between "professional status" and "nonprofessional work" was a subject of controversy in the matter of Shell Development Company, Inc., and the International Federation of Architects, Engineers, Chemists, and Technicians, case XX-*R*-552. It well may be an issue in future cases before the Board.

The committee suggests the following definition: A person employed in a bona fide professional capacity is any employee engaged in:

1. Work predominantly intellectual and varied in character, as opposed to routine mental, mechanical or physical work.

2. Work requiring the consistent exercise of discretion and judgment in its performance.

3. Work of such a character that the output produced or the result accomplished cannot be standardized in relation to a given period of time.

4. Work requiring knowledge of an advanced type in a field of science or learning customarily acquired by a prolonged course of specialized intellectual instruction and study, as distinguished from a general academic education and from an apprenticeship, and from training in the performance of routine mental, manual, or physical processes.

5. Work predominantly original and creative in character in a recognized field of technological endeavor involving invention, imagination, or talent.

6. Work of a nonprofessional character when scheduled for students or graduates of accredited colleges or universities as a part of their training and education to acquire a professional status as defined herein.

7. Work of a nonprofessional character performed temporarily as a part of a professional investigation.

It should be stated that criteria 1, 2, 3, and 4 have been taken without change from the definition of professional employee as defined by the Wage and Hour Division.[2] Criterion 5 also is taken from this report but in a slightly modified and abbreviated form, while 6 and 7 have been added to meet the requirements of junior engineers who are in the process of attaining a professional status, or engineers who have been assigned temporarily to nonprofessional work in order to further their research or investigation.

STATUS OF YOUNG ENGINEERS DOING NONPROFESSIONAL WORK

The Committee has given serious consideration to the status under the National Labor Relations Act of young engineers who may be attending or who have graduated from an accredited engineering school but who, as a part of their training, are working on nonprofessional jobs. The question is frequently asked—Would young engineers on nonprofessional jobs be compelled to join organizations of nonprofessional employees while performing such work, or would they be permitted to join an organization of professional employees if they desired to do so?

In answering this question it should be pointed out that engineers could be compelled to join a labor organization only if a closed or union shop prevails in the bargaining unit in which the engineers are performing nonprofessional work. The Board does not order employees to become members of labor organizations. Its task is to decide what the bargaining unit shall be in specific situations which are brought before it. In determining the bargaining unit, the Board must decide whether engineers shall or shall not be included.

The action to be taken by the Board probably would vary with the circumstances in each case. If a union and an employer both agreed that young engineers on nonprofessional work should be included in a particular bargaining unit then the Board as a rule would accept the arrangement. Again, if a union at the request of the employer agreed to exclude such employees, the Board in the absence of any protests probably would accept this disposition of the matter. If a union insisted upon the inclusion of such engineers in a bargaining unit, the Board presumably would apply the criteria listed above and make a decision on the basis of the factors prevailing in a given situation. If young engineers in this category had been members of a bona fide union in the plant or industry for a period of years, the Board undoubtedly would be reluctant to disturb the prevailing arrangement. Where no precedent had been established and a majority of the engineers had refused to sign membership cards but instead insisted upon membership in an association of professional employees, the Board in all likelihood would give careful consideration to their request. In such a situation resort to the Globe doctrine would seem to be the logical course of action.

We may conclude, then, that engineers can be compelled to join a labor organization only where they have been assigned to a particular bargaining unit and a closed or union shop has been established for that unit by voluntary agreement between the union and the employer.

TYPES OF LABOR ORGANIZATIONS OPEN TO ENGINEERS

One of the problems which would have to be faced by engineers is the selection of the type of labor organization which they would wish to represent them when some form of organized representation becomes desirable. A number of possibilities present themselves. Each of the types of organizations listed below may or may not be associated with a national labor organization or a national federation of labor unions. The various possibilities are:

1. An organization of production workers.

2. A heterogeneous organization of professional and nonprofessional employees.

3. An organization of engineers.

4. An association of engineers and employees in closely related professions such as chemists, physicists, and so forth.

5. An organization of all professional employees.

In the opinion of the committee the first of these possibilities is definitely un-

* A definition of a professional employee helps to define the jurisdiction of a professional-employees organization and should be an important guide to the NLRB in determining an appropriate bargaining unit.

suited to the needs of the engineers. Acceptance of the second would depend upon the history and status of industrial relations in the company, the wishes of the employees, the attitude and integrity of management, and the economic position of the company in the industry. The remaining three possibilities are all suitable forms of labor organizations for engineers. The inclusion of all employees engaged in professional work in a single bargaining agency would make for a larger membership, which in turn would give the agency more prestige whether it becomes associated with one of the national federations of labor organizations or operates as an independent organization. Such an association, when organized on a national basis, would have a substantial treasury which would enable it to engage organizers, retain a research staff, and maintain competent officers and counsel. On the other hand, the more restricted the bargaining agency the greater the community of interest among the members and the easier the task of administration. Internal conflicts of interest would be less likely to arise and objectives and programs could be developed more easily, but external conflicts, such as jurisdictional disputes, would be more likely to occur. Moreover, restricted organizations add to the difficulties of maintaining mutually satisfactory industrial relations, and many separate bargaining agencies not only are time consuming but also complicate the collective-bargaining process.

The committee believes that the choice of the form of organization should be left to the engineers and their associates engaged in professional work. It recognizes that the appropriate bargaining agency may well differ from establishment to establishment. It wishes to point out, however, that the Institute may quite properly advocate and urge on its employee members that in all cases before the National Labor Relations Board they ask for any one of the last three forms of organizations, namely, an association for engineers alone, an association for engineers and their associates in closely related professions, or an association of all employees engaged in professional work. A statement addressed to its members pointing out the form of organization which it believes to be in the best interests of the engineer is quite in order and would not be detrimental to the Institute or its members. The foregoing, however, would not be a proper argument for the Institute to make directly to the National Labor Relations Board in an individual dispute case, because in such cases the Board is concerned only with the wishes of the employees and the enforcement of the Act.

Where a bargaining agency for professional employees exists or is being formed, the committee believes that every effort should be made to include junior engineers. If young engineers are left out of the professional unit and included in a nonprofessional unit in which they happen to be working temporarily, their interests will not be fully protected. It should be noted that this arrangement has precedent. For example, a pattern maker who is temporarily assigned to work with production employees usually is excluded from the bargaining unit of production workers and retained in the unit of the pattern workers, most of whom ordinarily work in a separate pattern shop.

If young engineers are included in a bargaining unit of production workers in which they happen to be working temporarily, they may be brought under a closed-shop or a union-shop arrangement which might give rise to misunderstandings and irritation when they desired to move up to their regular professional positions. Moreover, they may want to belong to a professional organization during the time they are temporarily assigned to nonprofessional work, and, if covered by a closed-shop agreement, they would have to pay dues in two labor organizations. To avoid such complications it would seem advisable to recommend to these young engineers that, whenever they deem it advisable to choose a collective-bargaining representative, they seek admission to a group representing professional employees.

Appendix I. Glossary

Employer as defined in the National Labor Relations Act "includes any person acting in the interest of an employer, directly or indirectly, but shall not include the United States, or any state or political subdivision thereof, or any person subject to the Railway Labor Act, as amended from time to time, or any labor organization (other than when acting as an employer), or anyone acting in the capacity of officer or agent of such labor organization." (Section 2(2).)

Employee as defined in the Act includes "any employee, and shall not be limited to the employees of a particular employer, unless the act explicitly states otherwise, and shall include any individual whose work has ceased as a consequence of, or in connection with, any current labor disputes or because of any unfair labor practice, and who has not obtained any other regular and substantially equivalent employment, but shall not include any individual employed as an agricultural laborer, or in domestic service of any family or person at his home, or any individual employed by his parent or spouse." (Section 2(3).)

Representative as defined in the Act may be "any individual or labor organization." (Section 2(4).)

Labor Organization as defined in the Act "means any organization of any kind, or any agency or employee representation committee or plan, in which employees participate and which exists for the purpose, in whole or in part, of dealing with employers concerning grievances, labor disputes, wages, rates of pay, hours of employment, or conditions of work." The Board, in accordance with the purpose of the Act (specifically Section 8(2)) has refused to certify unions initiated, aided or dominated by employers.

Bargaining Unit comprises those classifications of employees that are (*a*) to be included for the purposes of collective bargaining and (*b*) to be covered by the wage contract. The definition may specify the classification to be included or it may list those to be excluded. It may be a craft, plant, company or a subdivision thereof. (Section 9(*b*).) It is important to note that the Board makes a distinction between the bargaining unit and the labor organization of employees. The Board is not concerned with the composition of the organization so long as it is free from employer domination. Its membership may be less inclusive, more inclusive or coextensive with the bargaining unit. A labor organization of professional employees, for example, could admit to membership young engineers, professional employees temporarily engaged in nonprofessional work, and employees whose work is of a semiprofessional nature. It might not, however, be certified by the Board as the bargaining agency for any of these special classifications. In making its decision as to what the bargaining unit shall be, the Board strives to bring together in one single unit those employees who have a community of interest which is likely to further harmonious organization and facilitate the objectives of collective bargaining.

Majority-Rule Principle means that where a union is designated by the majority of the voting employees in a bargaining unit, it automatically becomes the sole bargaining agent for all employees (nonmembers as well as members) in the unit.

Union Status is the basic relationship which prevails between the union and the employer under a wage contract. It is a matter of great importance to both the union and management. The more common types of union–management relationships are:

Closed Shop. An arrangement under which (*a*) all employees in the *bargaining unit* are required to belong to the union as a condition of employment and (*b*) the employer agrees to hire only union members (sometimes also to hire only through the union) so long as the union is able to supply needed employees.

Union Shop. An arrangement under which the employer may hire new employees from any source but said employees must become members of the union, usually after a specified trial period.

Preferential Shop. An arrangement under which union members are given special consideration in certain aspects of employment, most commonly in lay-offs and rehiring and sometimes in hiring and promotion.

Maintenance of Membership. An arrangement which does not require any employee to join the union, but which requires those employees who were members when the contract was signed and who failed to resign during the "escape period" (usually 15 days) as well as those who later joined the union, to continue as members during the life of the agreement.

Sole Bargaining Agent. An arrangement under which the union is recognized as the only bargaining agency for all the employees in the unit. Under this type of union–management relations employees may either join or refrain from joining the bargaining agency.

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1. Eighth Annual Report of the National Labor Relations Board, 1943 (fiscal year). United States Government Printing Office, Washington, D. C. Page 53.

2. Executive Administration . . . . . Salesmen Redefined. Report of the Wage and Hour Division of the United States Department of Labor, October 20, 1940. United States Government Printing Office, Washington, D. C.

Electric Propulsion for Ships

H. C. COLEMAN

This article contains a brief outline of the fundamental component parts and scheme of operation of the various types of electric propulsion systems. Historical data on the electric drive are included which indicate present trends and possible future developments.

ALTHOUGH the application of electric equipment for the propulsion of ships had a humble beginning and progress was slow at first, its use has been extended greatly, particularly in the last 20 years, so that now electric propulsion, both by direct and alternating current, is a very important factor in marine transportation. This is evidenced by the fact that up to October 1, 1944, more than 870 propulsion plants of the turbine-electric type totaling approximately 7,600,000 shaft horsepower and more than 940 of the Diesel-electric type totaling more than 2,600,000 shaft horsepower had been built or contracted for in the United States.

Many applications of the turbine-electric type with a-c drive are being made on passenger and cargo liners, tankers, and Coast Guard cutters. The present war has brought about the use of turbine-electric a-c drive on many Maritime-Commission and Navy ships, partly because of a lack of gear-cutting capacity. It would seem that this type of electric propulsion will find its future field of application mainly on vessels of special requirements where, for instance, the auxiliary power load in port is an appreciable percentage of the total power of the propulsion plant, so that the main generator may be used for this supply; also possibly, it will be used wherever operating conditions dictate the need for full power astern when maneuvering.

Developments on the Diesel engine prior to and during the war have led to higher-speed and lighter-weight machines which can be applied most conveniently to ship propulsion in multiple units by utilizing electric transmission. This type of prime mover with d-c equipment will probably continue to be a favorite form of drive for special classes of vessels normally requiring a good deal of maneuvering, while the a-c drive will be utilized on vessels requiring a considerable amount of power and infrequent maneuvering.

RUSSIAN CONTRIBUTIONS

Records show that electric propulsion of ships had its beginning more than 100 years ago. The credit for the historic experiment goes to the Russians. In 1839 they built a boat capable of carrying 12 passengers, and propelled by an electric motor supplied with energy from a 69-cell storage battery. Strangely enough, the motor proved to be the weak link, and the experiment was soon forgotten. The next experiment was by the British in 1882, but no details are available. In the period from 1886 to 1888, two British and two French submarines of very small size were built and fitted with electric motors fed from storage batteries. Another experiment in electric propulsion of a surface vessel was made in 1903, again by the Russians. They built a shallow-draft

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Essential substance of an address given before the AIEE, Seattle, Wash.; Portland, Oreg.; San Francisco, Calif.; and Los Angeles, Calif.; Sections.

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tanker for operation on the Volga River. The machinery consisted of three three-cylinder Diesel engines each driving a generator and exciter and three propulsion motors each driving a screw. The control system was of the variable-voltage type. The vessel continued in service until 1913.

THE A-C SYSTEM

The first use of the a-c system of propulsion was in 1910, when the British made an experimental installation on a passenger launch. It had a single Diesel engine driving a special alternator with independent windings for four or six poles and a propelling motor wound for 8 and

Figure 1. Lowering completely assembled propulsion turbine-generator-condenser unit into vessel

12 poles. The motor had a squirrel-cage winding, and bridge control was provided. The same experimenter made another installation in 1913, using two Diesel generating sets and a squirrel-cage-type propulsion motor. The experiment was not very successful, probably because the engines were of insufficient capacity for the propeller and gave trouble with frequent breakdowns. The next development was made in the United States in 1913, when the Navy made an experimental installation on the 5,400 shaft horsepower twin-screw collier "Jupiter." This plant involved two propulsion turbine-generator sets supplying power to wound-rotor induction motors. The success of this installation led the Navy Department to adopt this form of drive on several battleships and aircraft carriers which were then being designed.

In the early development of this type of propulsion, wound-rotor motors, together with the attendant complicated and heavy control, were utilized, along with comparatively slow-speed heavy turbine-generator sets operating at about 30 cycles. Development progressed through the stage of the squirrel-cage motor and finally to the synchronous motor with simplified control and smaller and lighter turbine-generator sets. During the last 15 years, many developments have taken place which have greatly improved this type of propulsion equipment. The art of welding has been utilized to a great extent in practically all parts of the machinery with a considerable saving in space and weight. Methods have been worked out so that the operating speeds of the turbine-generator sets have been materially increased so that some modern units operate at 90 cycles. This has afforded a great saving in space and weight. As in the case of d-c equipment, improvements have been made in the ventilating systems and in the application of insulating materials of higher grade. Through experience, testing, and research, a much better knowledge has been obtained of the actual performance characteristics of propellers and types of vessels, so that the electric equipment can be better designed to fit the actual conditions. In the early installations, the electric equipment was designed with sufficient inherent torque margin to provide stability in the system under maximum conceivable conditions. This meant large and heavy equipment. In recent years, systems have been developed to provide automatic stability control in the electric system so that the overexcitation required during peak-load swings is applied automatically and only during the period needed. This enables the designer to save weight and size on the apparatus. Another means of saving in weight on the machines is the use of dynamic braking to stop the propeller in reversing. By means of suitable resistors and control connections, the return energy of the propeller during reversing is absorbed externally to the machines.

A-C VERSUS D-C SYSTEMS

The a-c equipment is very desirable for electric propulsion from the standpoint of minimum size, weight, cost, maintenance, and simplicity. However, for vessels of relatively small power and special service, these advantages are overbalanced by the greater control flexibility and better performance of the d-c equipment. Thus, a-c propulsion is most adaptable to ships requiring considerable power. With this system there is a fixed ratio between the speed of the prime mover and the propeller—the inverse of the ratio of the number of poles on the generator and motor. Thus, in effect, the a-c drive accomplishes the same results as the use of reduction gears with the added functions of providing for reversal and thus permitting the prime mover to develop full power astern greater flexibility and damping tending to reduce torsional vibration.

The a-c Diesel-electric system is the most recent type to receive serious consideration. Considerable development was carried out in Europe in the period

Figure 2. Pilot house on the *Juniper* showing new-type control desk

from 1936 to 1939, and five vessels were built, the later installations utilizing synchronous motors. Development in the United States started in 1939, when a special plant was installed in a tuna fishing boat at San Diego, Calif. This plant consisted of three Diesel-driven generating units operating on a constant frequency bus which supplied both auxiliary power and power for a tandem arrangement of three wound-rotor induction motors driving the propeller through a reduction gear. The three motors were of different capacity and pole combinations, so that three basic speeds were obtained when operating from the constant-frequency 60-cycle ship's bus. The only other installation in the United States was made in 1941 on a large twin-screw Naval vessel. The plant included two 5,900-horsepower direct-connected synchronous motors and eight Diesel-driven generating sets. Both of these installations have given excellent service, and the experience gained in designing, building, and operating these equipments, leads to the conclusion that these systems are entirely satisfactory for vessels of this class and ships of similar power requirements.

DIFFERENCES IN OPERATION

The a-c Diesel-electric system comprises component parts similar to those of the d-c Diesel-electric drive. However, the operation of the system is entirely different and is comparable with the a-c turbine-electric drive. The fundamental principles of speed control and reversal of the propulsion motor are similar to those described for turbine-electric a-c drives. The main difference is, of course, that with the Diesel-electric system, several prime movers are used which makes necessary the parallel operation of the generator units on the propulsion motor bus over a speed range of about 25 per cent to full speed on the engines and with varying load. Also, means are required for switching and synchronizing the propulsion generators. However, only the actual connection switches are used, as no elaborate synchronizing devices, such as are necessary in a power plant on land, are required.

Because of the limited torque capacity of the Diesel engine at idling speed, special precautions are necessary to control the torque placed on the engines during starting and maneuvering. This takes the form of a simple torque regulator. The engine governors must be specially designed and carefully applied so as to provide very closely the same speed-regulating characteris ics.

An examination of the most common form of a-c propul ion reveals this to be the turbine-electric system. Such a propulsion plant would comprise a boiler plant, a single high-speed, variable speed, nonreversible steam turbine driving a direct-connected propulsion generator, a condenser, a propulsion motor, a source of excitation power, control equipment, connecting cables, and certain auxiliaries.

The modern a-c turbine-electric propulsion plant makes use of synchronous generators and synchronous propulsion motors with heavy pole face or damper windings especially designed to provide the necessary maneuvering characteristics. The motor and generator operate at approximately unity power factor over the entire speed load range. Speed control of the propeller is accomplished entirely by varying the frequency, which means varying the turbine speed. The control equipment for this type of propulsion is simple. It provides three main functions:

1. Control of the turbine governor in order to obtain various speed settings, by means of a simple lever and mechanical connection.

2. Connection of the circuit from the motor stator to the generator stator and for interchanging two phases of this three-phase connection for reversal, by means of air-break contactors operated by cams from a lever.

3. Connection of the generator and motor–field circuits to the excitation power source, by means of contactors operated by cams from a lever.

In starting the ship from rest, the turbine speed is adjusted to the idling position, usually about 25 per cent of full speed. The circuit from the motor stator to the generator stator is closed with no excitation on the motor field, which is short-circuited through a fixed resistance, and at the same time the circuit applies heavy overexcitation to the generator field. The motor starts as a squirrel-cage induction motor, operating on the damper windings. It quickly accelerates to a speed nearly synchronous with that of the generator and is then synchronized by applying field excitation to the motor. The generator excitation is then reduced to normal. Excitation power is usually taken from the ship's auxiliary-power bus or from a special exciter driven by the same prime mover which drives the ship's auxiliary-power generator.

By far the greatest number and variety of installations have used d-c transmission. The fundamental reasons for this are found in the inherent characteristics of superior torque performance and greater control flexibility, refinement, and economy of the d-c transmission compared with the a-c system. Part of the greater control flexibility comes about because there is no fixed-speed ratio between the prime mover and propeller as there is with the a-c system, so that the ratio may be adjusted by controlling the excitation of the motor and the generator.

In the most common form of d-c propulsion, namely, the Diesel-electric, the electric drive makes possible the use of several, high-speed lightweight nonreversible engines to drive a single slow-speed efficient propeller. Such a propulsion plant would normally include two or more engine-driven generators, a propulsion motor, a source of excitation power, suitable control equipment, connecting cables, and certain auxiliaries. If applied to a multiple-screw vessel, a similar plant would be provided for each propeller. In some installations two or more motors may be connected to the propeller through gearing. The control system used on most propulsion systems of this type is exceedingly simple, and is known as the variable-voltage system. The generators and motors are of the shunt wound separately excited type with the field excitation supplied from either small exciters driven by the main engines or by the ship's constant-voltage auxiliary-power bus. The propulsion-motor field is excited at a constant value, while the excitation of the generator fields is varied from zero to full value in either direction by means of a simple control device. And so the output voltage of the generators applied to the propulsion motor is simply controlled,

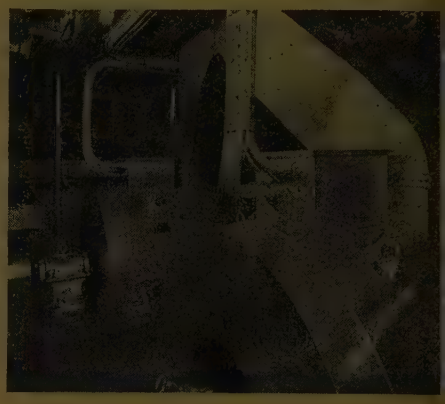

Figure 3. Two d-c propulsion motors on Diesel-electric lighthouse tender *Juniper*

thus regulating the speed and controlling the direction of rotation of the motor. On modern installations using high-speed engines, the speed control on the propulsion motor is obtained partly by this variable-voltage control system plus a certain amount of control of the engine speed, which, of course, also affects the generator output voltage.

USE IN UNITED STATES

In the United States the first Diesel-electric installations were made in 1919 and consisted o. a yacht and a trawler. These first installations were greatly handicapped by the size and weight of the equipment. The engines were of low speed, 150 to 200 rpm, and of very heavy construction. The electric equipment was largely of cast, heavy construction. On this yacht installation, which was a conversion job, two engine–generator sets were supplied together with a single propulsion motor and control equipment. When it came time for installation, it was found that the equipment was so large and heavy that it could not be gotten into the vessel. Fi-

ally, only one engine–generator set was installed, and the generator from the other unit was converted into a propulsion motor. As a result, the motor which was built for the job found itself diverted to some other use on land. In early efforts to develop this form of propulsion, there were many difficult times in trying to convince owners that troubles experienced were not inherent in the electric end of the propulsion system.

The intervening years since the early installations have shown great progress in the application of this form of propulsion, such as:

1. Development of the medium-high-speed engine with rotative speeds of from 400 to 450 rpm.

2. Substitution for heavy cast construction in both engines and electric equipment of welded steel structures, affording greater strength and a great saving in weight and space.

3. Development of suitable speed control for the engines.

4. Development of simplified compact unit cubicle-type propulsion control.

5. Improvement in ventilating systems of the electric equipment.

6. Employment of superior grades of insulation allowing higher operating temperatures and consequent reduction in size and weight.

The first turbine-electric d-c propulsion plant installed in the United States was on a fireboat in Chicago. Other installations, totaling nine, were made on ferryboats, river towboats, and hopper dredges.

In the d-c turbine-electric system, the electric equipment and method of control are exactly the same as for the Diesel system, with the exception that the generator operates at constant speed since this gives the best performance of the prime mover. In this system a high-speed turbine with a reduction gear is substituted for the Diesel engine, and, of course, a boiler plant together with the necessary condenser and auxiliaries is required.

At the present time manufacturers are constantly conducting studies, tests, and research in an effort to improve the equipment and to decrease size, weight, and cost, and to improve performance. It is hoped that this work will produce improved systems. The most hopeful outlook appears to be in the utilization of better materials. These may include magnetic materials, and particularly, better insulation materials such as glass, and the new synthetic inorganic varnishes which will permit operating at considerably higher temperatures than now used. After the war an ample supply of aluminum and magnesium at reasonable cost is looked for which should more extensively reduce weights of equipment. Thus, in the future, it is expected that electric propulsion will be further developed and its use extended more in the next 20 years than it has been in the past quarter century.

Statistical Methods in Quality Control

II. Two Kinds of Measurement—Variables and Attributes

The difference between measurement by variables and measurement by attributes and the use of the arithmetic mean and standard deviation in solving engineering problems are discussed in this article.

BASICALLY, engineering characterizes a natural property or quality by counting or classification on some scale of measurement. When the numerical magnitude of a variable characteristic of some specimen is determined, we employ the *method of variables*. Illustrations are the use of micrometer for measuring a spindle diameter, or a voltmeter for measuring a line potential. In view of the practical restrictions to distinguishing all orders of increments of a continuous scale, the value of any observation is limited by the graduations on the measuring instrument and in essence gives one of a series of discrete values. However, we are dealing with a continuous variable.

When one is examining or testing a specimen for its conformance or nonconformance to a specified requirement, there can be classification into one of two classes only. This is known as the *method of attributes*. Examples are: visual inspection of a spindle for flaws; inspection of a bolt for length, by a go–no-go gauge; testing a dielectric for breakdown at a given voltage. In some cases, attributes results may be used, based upon a variables scale of primary measurement, it being noted whether or not a value falls outside given tolerance extremes or limits. For example, the allowable limits in variation of plate current for an electronic tube may be 10.5 and 12.0 milliamperes. Measurements may be made to a nearest quarter milliampere, but the tube would be recorded only as good or bad.

A common problem is the *collective* characterization of quality of a number of similar specimens in a sample or lot. The two methods would compare as follows:

1. *Method of Variables.* Manifold classification or distribution on a continuous scale. Any single value is designated as (X); the collective quality by a frequency distribution, and/or by such condensation functions or statistics as the average $(\bar{X})$, the standard deviation (σ), described in the following.

2. *Method of Attributes.* Two-way classification as good or bad, with respect to specified requirements. The collective quality is expressed as a number bad (c), or a fraction $(\bar{p})$, of the total number of specimens examined or tested (n).

Some quality characteristics can be measured only by the method of attributes; for example a condenser breaks down at a given voltage or it does not, a glass stem is cracked or it is not. In many cases, however, either method may be used, the choice industrially being influenced largely by economy, convenience, and reliability. A comparison of such considerations is given in Table I.

We have seen in the preceding article of this series that repetitive observations vary, given sufficient sensitivity of method, and that a distribution or spread of values is obtained. As quantitative recognition of this variability is necessary in technical projection and inference, we analyze the properties of such distribution. Figure 1

One of a series of articles prepared in the AIEE subcommittee on educational activities and sponsored by the AIEE subcommittee on statistical methods.

Personnel of the AIEE subcommittee on educational activities: J. Manuele, H. F. Dodge, A. I. Peterson, and R. E. Wareham.

illustrates the differentiable characteristics, such as average value or location on the scale, spread or dispersion, and skewness. To condense the information contained in a frequency distribution, we employ certain "statistics" of the collective quality.

The most important function or statistic is usually the *average*, or arithmetic mean, to determine central tendency or position of a group of n observations, defined* as

$$\bar{X} = \frac{X_1 + X_2 + \ldots + X_n}{n} = \frac{\sum_t X_t}{n}$$

Of next importance is dispersion or spread of the observations. The statistic preferred, for amount of information contained and for amenability to mathematical manipulation, is the *standard deviation*, σ. It is the rms deviation of the observed values from their average;* that is:

$$\sigma = \sqrt{\frac{(X_1-\bar{X})^2 + (X_2-\bar{X})^2 + \ldots + (X_n-\bar{X})^2}{n}}$$

$$= \sqrt{\frac{\sum_t (X_t-\bar{X})^2}{n}}$$

$$= \sqrt{\frac{\sum_t X_t^2}{n} - (\bar{X})^2}$$

Another measure of dispersion, used in small sets of observations, is the Range, R, defined as the difference between the largest observed value and the smallest observed value; that is:

$$R = X_{max} - X_{min}$$

The use of a limited number of statistics to condense original data entails slight loss of information. But in view of usually inexact knowledge about any true underlying distribution, the practically essential information from a distribution in engineering problems is provided by the arithmetic mean, $\bar{X}$, the standard deviation, σ, and the number of observations, n. In rarer cases, with a large number of observations, a skewness measure is used.

These two functions contain essential information, even if little is known about the functional form of the distribution. Without any reservations as to form, or as to how any set of values was obtained, the use of $(\bar{X})$ and (σ) allows us to say that at least the proportion $(1-1/t^2)$ of the total number (n) of observations lie within the range $\bar{X} \pm t\sigma$, where t is any chosen number of sigmas not less than 1. Thus, if t is taken as 3, the *minimum* is roughly 89 per cent. However, in most cases of engineering data, experience has indicated that well over 96 per cent may be expected in the range of $\bar{X} \pm 3\sigma$. This is one of the considerations involved in the choice of three-sigma limits for chance variability in much quality control and other statistical work.

Table I. Comparison of Method of Variables and Method of Attributes

	Variables	Attributes
Time necessary for testing	High	Low*
Skill necessary for testing	High	Low*
Cost of test equipment	High	Low*
Amount and complexity of records	High	Low*
Information per observation	High*	Low

* Generally favorable considerations.

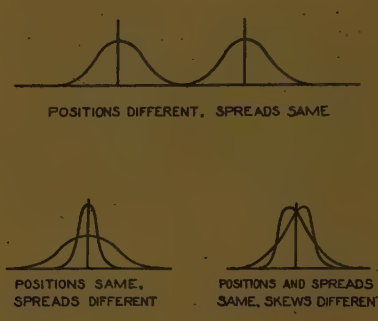

Figure 1. Characteristics of distribution

A frequency summary for 200 of the afore-mentioned tubes inspected for plate current by the variables method was found to be as given in Table II.

The relationship between the collective quality by attributes and variables methods is further demonstrated. By the former method we would know only that 90 per cent were not outside limits, or at most that 4.5 per cent were too low and 5.5 per cent were too high. By the variables method, we could describe the actual distribution and state that the average was 11.269 milliamperes and the standard deviation was 0.520 milliampere.

It can also be seen, in this more symmetrical case, that plus and minus three standard deviations would include 100 per cent rather than the 89 per cent minimum guaranteed by $(1-1/t^2)$.

Table II. Frequency Summary for 200 Tubes Inspected for Plate Current by Variables Method

Cell Mid-Point Value	Frequency f	Relative Frequency	
9.75	1	0.005	
10.00	2	0.010	
10.25	6	0.030	Lower specification limit
10.50	9	0.045	
10.75	23	0.115	
11.00	36	0.180	
11.25	44	0.220	0.90 or 90 per cent "good"
11.50	35	0.175	
11.75	22	0.110	
12.00	11	0.055	
12.25	5	0.025	Upper specification limit
12.50	4	0.020	
12.75	2	0.010	
Total	$f=200=n$	1.000	

REFERENCES

1. American Society for Testing Materials Manual on Presentation of Data, Philadelphia, Pa.
2. Economic Control of Quality of Manufactured Product, W. A. Shewhart. D. Van Nostrand Company, Inc., New York, N. Y., 1931.
3. Production Handbook, Ronald Press Company, New York, N. Y., 1944. Pages 675–726.

* When n is large, the grouped frequency distribution is used, and the statistics are calculated more easily by the short method found in statistical texts. See reference 1, pages 17–20.

X Rays Alter Wave Length, Change Color of Gems

X rays and other types of radiation, including cathode or electronic rays and deuteron beams from a cyclotron, when allowed to pass through plates cut from crystalline substances, alter the mechanical strength or the material. There are accompanying changes in the color of the crystals, and the chemical reactivity also may be altered.

These discoveries of Clifford Frondel, former senior physicist of the United States Signal Corps and research associate at Harvard University, Boston, Mass., were recently demonstrated at the Reeves-Ely Laboratories, New York, N. Y.

It was explained that the X rays cause an interchange of electrons between the atoms composing the crystal and, by altering the interatomic bonding forces, change the elastic constants of the material. By this irradiation it is possible to regulate the frequency of the quartz crystals used in radio and radar.

Millions of tiny plates of crystalline quartz are used by the armed services as oscillator plates to control radio communications. The frequency at which the radio will transmit or receive is controlled in common types of crystals by the thickness of the plate, brought to proper thickness by a delicate operation. By using the new X-ray irradiation technique, oscillator plates can now be adjusted rapidly and easily to a desired frequency with a precision hitherto impossible.

Another interesting application of X rays is in the altering or the increasing in intensity of gem stones, and some colorless stones of little value may be given intense hues. Diamonds have been colored green and golden brown by irradiation with deuterons.

Irradiation with X rays also has been found to modify greatly the rate of the solution and the chemical reactivity of crystals, a fact which may open up a new field of X-ray photochemistry.

Civic Responsibilities of Engineers

THE ENGINEER, by virtue of his professional standing, has important civic responsibilities, beyond those of the ordinary citizen. For example:

1. Engineering has transformed our ways of living, providing modern conveniences, mechanizing industry, and annihilating distance. These changes have required that vast numbers of people perform highly specialized tasks, making their livelihoods depend on the continued smooth working of both industry and government. Furthermore, with the advance in civilized living, any interruption of public service by wars, depressions, or other disorders, produces a vastly greater human distress.

Therefore, the engineer has an obligation to go beyond his specialized tasks, and do whatever he can to have the best use made of technical knowledge, for the public benefit. The public recognizes the engineer as the agent of economic changes, and looks to him for a remedy whenever technical knowledge is misused, or technical services fail to function.

2. The engineer's training teaches honesty, since he learns that nature cannot be deceived. Also, his experience should develop a co-operative spirit, since engineering projects require that many specialists work in harmony. Thus, the engineer should be thrice fitted to be an instrument of public service, by his technical skill, his adherence to facts, and his experience in organized teamwork.

Professional ethics require that these special abilities be applied for the benefit of the community in which the engineer lives, for the principle of the income tax, whereby the rich give more to the public revenue than the poor, is generally accepted. The same principle suggests that the man with special knowledge or ability has greater civic responsibilities than others.

3. The continuing benefits that will arise from further technical progress, in improving the standard of living, conservation of natural resources, and promoting good will at home and abroad, are dependent on better public understanding of technical problems.

The engineer, therefore, has a responsibility for improving technical education and for aiding the public to understand technical matters of importance to the community.

PUBLIC RELATIONS

The civic actions of engineers may, among other things, consist in:

1. Suggesting that a technical project be considered by the proper authorities.

2. Studying or expounding reports on a project to aid in broadening public understanding of its technical aspects.

3. Recommending individuals qualified for specific appointments; or the employment of competent engineering firms to undertake specific tasks.

4. Educational programs.

Naturally, such recommendations have more value if they express the considered thought of a group, or of a selected expert, rather than the views of a self-appointed critic. An individual may act in a small town, however, with the same effect as a committee in a city, or a section of a national engineering society in a greater area. In any case, the final action is taken by an individual, who is responsible for its technical soundness.

Engineers are well fitted by professional training and experience to take an active part in community and public affairs, but unfortunately they commonly are not inclined to do so. Wider participation of engineers in public affairs is advocated in this article.

The simplest way to be useful in public affairs is to co-operate with the local planning authorities. If there is no city, county, or regional planning commission in existence, an engineer properly may recommend to the public officials that such a commission be formed. If a planning commission exists but is inactive, it is appropriate to recommend some change in the existing law, or the appointment of additional qualified members, that will assist the commission to function effectively.

It is important also that local industry and business have active planning bodies. An engineering society properly may make recommendations to the officials of such groups as the chamber of commerce with even greater force than to public authorities.

When a capable planning commission exists, the chairman may be invited to present to the engineers a résumé of their projects in hand or objectives in view, and the engineers in turn may suggest additional projects for study.

When a project is proposed, individual engineers or committees may study the subject and give the planning commission their suggestions in regard to it, or the employment of qualified engineers to make formal recommendations may be suggested.

When a project is finally decided on by the commission, well-informed engineers may be helpful by addressing civic groups on the technical aspects of the proposal, or otherwise aiding the public to appreciate the questions at issue.

The legal, financial, and political aspects of any public question are often more important than the technical aspects, or harder to decide. The purely technical engineer cannot speak with authority in such matters. To be helpful, he must analyze and present facts, not advocate. His role is that of the expert witness. There are, however, a few engineers with sufficient judgment and breadth of experience to make over-all decisions, and these may be brought in for counsel when the need arises.

To be sure, the engineer is also a citizen, and so has a right to express his opinion on any public matter, but his preference counts no more than that of any other voter. If he allows his personal bias or his self-interest to enter into his factual reports, his testimony is discredited.

INDIVIDUAL RESPONSIBILITY

The practice of professional engineering, which includes all engineering services to the public, is restricted in most states to registered engineers, who have met the requirements of state law. Also, no engineer properly can make a report on which official action is to be taken without accepting full responsibility as an individual.

One principle of success in public relations, therefore, is that any factual reports on public affairs made under the auspices of an engineering society be the responsibility of individual engineers, rather than of the society as a whole. The group may suggest the project, and aid in finding a qualified engineer who will undertake the work. It is his responsibility to perform it in strict accordance with the engineer's code of ethics. The report itself should stand or fall on its own merit. The society, however, may support the conclusions by publishing endorsements of qualified technical committees or by formal organizational approval after due consideration.

In expressing their opinions on any subject, the officers of a national-engineering-society section, or committee, should speak as individuals delegated by their associates to give their views. They should not state or imply that the full membership of their organization sup-

A report prepared by a joint subcommittee on civic affairs of the AIEE technical program and Sections committees. The subcommittee was formed by joint action of the technical program and Sections committees in April 1944, and was discharged after completing this assignment in December 1944. Personnel of the committee: P. L. Alger, *chairman;* H. W. Bibber, O. C. Brill, M. D. Hooven, A. C. Muir, and C. S. Purnell.

ports these views, because it is impossible for the entire membership to assimilate any one technical subject, even if they were qualified to do so.

THE ENGINEERING METHOD

On the wall of the library in the Engineering Societies Building in New York, N. Y., is this definition:

"ENGINEERING: The art of organizing men, and of directing and controlling the forces and materials of nature for the benefit of the human race."

Most engineers, while technically expert in a particular field, are not skilled in the art of organizing men, nor can they foretell any better than other men what actions will most benefit people in years to come.

The engineer, however, has a particular virtue besides his technical skill, and that is his training in the engineering method. This method consists in experimenting, observing, and keeping an open mind, so that every proposal will be thoroughly tested before acceptance. Rather than accepting established methods or arbitrary statements, the engineer devises tests to check them.

In the field of human relations, this engineering method requires the democratic spirit of seeking advice from whoever can give it, and continually modifying ideas in the light of experience.

Perhaps the greatest contribution engineers can make in civic affairs is to apply the engineering method of analysis, substituting facts for opinions, and gaining decisions by tests rather than debate. The engineer should seek to impart this method to others, so that they may become more self-reliant, rather than to attempt himself to solve problems beyond his experience. In this way, the engineer will still be "sticking to his last," even though he enters the broad field of civic affairs.

CO-OPERATIVE ACTIVITIES

It is evident from this review that close co-operation between the many types of engineering specialists and the public authorities is desirable in these civic activities. Engineers are specialists, so that only by working co-operatively can they cover the wide range of technical problems that affect the public welfare.

Civic responsibilities are shared in some degree by all men of professional standing. The medical and legal professions have long recognized this, and by organizing co-operatively in county associations have been able to perform creditably many civic tasks. Public officials habitually look to these associations for guidance in the fields of public health and law. Similarly, business men have organized chambers of commerce for co-operative civic actions. Following this trend also, the National Society of Professional Engineers has gained wide recognition as a leader in the organization of engineering talent for public service.

It is, therefore, logical for the engineers resident in any community to form committees, or join forces with other groups to perform these civic duties. How engineers should organize co-operatively in a given community has been discussed on numerous occasions, and trials have been made of many different procedures. This experience was reviewed at an AIEE conference in St. Louis, Mo., in October 1941 and again in New York, N. Y., in January 1942.

CO-OPERATION IN PRACTICE

The general opinion at these conferences, and in discussion elsewhere, has been that co-operation may well be organized through the formation of a local engineering council, or club, or society composed of representatives of the local chapters of the national engineering societies and other local technical organizations. In this way, the experience of the existing national organizations will be utilized, and the participation of all engineers in the community will be secured.

Based on the reports presented by representatives of active engineering councils of this type and on the discussions at the conferences just mentioned, specific recommendations in regard to the organization, functioning, and activities of a local engineering council were presented by F. A. Cowan, as recorded in *Electrical Engineering* for March 1942, pages 148–9.

In conclusion, engineering results are achieved first by specialized knowledge and second by organized co-operation. The engineer gains some specialized knowledge in college, and extends it through his daily work, but the organizing skill required for effective co-operation in civic affairs is only learned through years of experience.

It is hoped that the suggestions in this report will inspire engineers to give thought to this important subject, and that they will aid them to be more useful in public affairs.

Scientific Methods in Diamond-Die Production

Small diamond dies, used to draw millions of miles of filament and resistor wires for wartime electronic equipment, are now precision-made by American workers. New scientific methods are used in diamond-die production instead of the previous method of hand-drilling and laborious polishing. Latest electronic developments depend on invisible wires drawn at high speeds through precisely drilled diamonds. Metal strands are drawn through microscopic channels, producing wires some of which are finer than 0.0008 inch in diameter.

SUPERFINE WIRES POSSIBLE

Microscopic drilling through rough one-fifth-carat diamonds provides the mirror-finish channels through which metals of various compositions must travel at high speeds, without breaking, to produce the critical wires demanded by war needs. The superfine wires which are the result of this process are used for electronic devices, or even woven into a "cloth" utilized in the manufacture of high explosives.

The efforts of the War Production Board and associated governmental agencies already assure the quality of the dies that will draw the wires for the vast requirements of the future. Shortly after Government die projects were initiated in late 1941, production stood at 1,200 dies per year, or 100 per month. Total contributions of all domestic die producers in April 1942 amounted to approximately 320 dies per month. These were of the superfine sizes.

Today the small diamond-die industry is on the threshold of inexpensive commercial drilling of diamonds to proper contours through assistance of electric sparks, according to the War Production Board.

LOWER DIE COST FORECAST

This new method of drilling was developed in research by the National Bureau of Standards and by prominent mineralogists and physicists in industry under the sponsorship of the diamond section through the War Production Board office of production research and development and the war metallurgy committee of the National Academy of Sciences. The process promises high significant results; finer dies at lower prices may soon be available to the wire-drawing industries as a result of American ingenuity superimposed on Old World methods, War Production Board officials recently declared.

INSTITUTE ACTIVITIES

IEE Board of Directors Meets in New York

Changes in Section territory and provision a new technical committee were among matters discussed at the meeting of the EE board of directors held in New York, Y., May 29, 1945.

Upon recommendation of the 1945 winter-chnical-meeting committee, the board took ion approving in principle the proposal at exhibits of electric equipment be held ncurrently with national and District chnical meetings and authorizing technical eting committees to co-operate with ap-opriate organizations in preparing plans such an exhibit in connection with any tional or District meeting, subject to the proval of the board or executive commit-.

It was voted to establish a new technical mmittee on industrial control devices with e following scope of activity, recommended the technical-program committee:

"Treatment of all matters in which the dominant fac-s are the design and construction of, but not the ap-cation of, industrial control devices exclusive of circuit akers, switches, fuses, network protectors, protector ays, supervisory control and automatic railway signal-, which are used in the central-station, communica-n, and transportation work and which are functions other designated technical committees."

As a result of a discussion on the scopes of e technical committees, the board took tion authorizing a committee to review the chnical activities of the Institute and recom-end any desirable changes in organization d procedure.

A revised report, dated May 17, 1945, of e committee on collective bargaining and lated matters was approved for publica-n. (See pages 239–45 of this issue.) The ard also authorized its release for publica-n at approximately the same time by other cieties and publications. The board ex-essed its appreciation of the excellence of e report and commended the chairman and e members of the committee for their work.

Upon recommendation of the committee constitution and bylaws, the following ntence was added to Section 27 of the by-ws:

Where by reason of public emergencies the Board of rectors shall deem it wise to do so, it may postpone or it altogether any of the customary conventions."

his amendment was suggested by legal unsel of the Institute in connection with dvice concerning the authority of the board directors to cancel the annual summer con-ntion, so that there could be no technical aim that the board of directors has not per-rmed its duty to provide for a convention.

In view of the increasing number of in-ances in which applicants for AIEE mem-rship name members of the board of direc-rs as references, the following resolutions ere adopted:

Resolved that the board of directors confirms previous tions by the board of directors and by the board of aminers to the effect that in general it is not desirable r names of members of either board to be offered as ferences in connection with applications for admission transfer, and that, in the absence of exceptional reasons for the use of such names, applicants shall be requested to supply other references.

Further Resolved that the foregoing resolution be printed as a footnote or otherwise on the application forms.

Upon petition the members of the board present voted unanimously for the election of Charles E. Skinner, a past president of the Institute, as an Honorary Member of the AIEE. Votes from the absent members were obtained by letter ballot, as the election of an Honorary Member must be by unanimous vote of the entire board.

In connection with conferences on Section operation and management planned in all Districts except Districts 3 and 10 in place of the regular delegates' meetings during the summer convention, the board, upon recommendation of the Sections committee, authorized travel allowance for the Sections committee's representatives in Districts 1, 2, 4, 5, 6, 7, 8, and 9 to their respective District meetings; the vice-president and the District secretary in District 10 and the chairmen and secretaries of the Montreal and Toronto Sections to attend the meeting to be held in District 1; and the chairman and the secretary of the Vancouver Section to attend the meeting to be held in District 9.

Upon petition by members of the Illinois Valley Subsection of the Urbana Section, approval by the Urbana Section, and recommendation of the Sections committee, the board authorized the formation of the Illinois Valley Section of the Institute, with territory consisting of 22 counties transferred from the Urbana Section.

Upon recommendation of the Mexico Section, the Sections committee, and the vice-presidents of Districts 3 and 7, the territory of the Mexico Section was transferred from District 3 to District 7.

Suggestions of the Philadelphia Section that special sessions on electronic subjects be provided at national technical meetings and greater consideration be given by future program committees to the subjects of communications and instruments and measurements were referred to the technical-program committee.

The appointment of a representative on the Washington Award Commission for the two-year term beginning June 1, 1945, was referred to the president.

Application, upon recommendation of the committee on research, to the Engineering Foundation for continued support, during the year beginning October 1, 1945, of the work of the Welding Research Council, was confirmed. The AIEE and the American Welding Society are joint sponsors for this work.

Upon recommendation of the chairman of the committee, it was voted to approve the discharge of the Joint Committee on Inter-American Engineering Co-operation.

Approval was given to proposals that the Joint Committee on Economic Status of the Engineer and the Joint Committee on Organization of the Engineering Profession be made special committees of the Joint Conference Committee, the last named consisting of the presidents, immediate past presidents, and secretaries of the Founder Societies and the American Institute of Chemical Engineers.

At the suggestion of Malcolm Pirnie, chairman of the committee, the president was authorized to appoint a representative from the New York City area on the action and advisory committee on construction of the Committee for Economic Development, and Gano Dunn subsequently was appointed.

The board confirmed action of the executive committee in voting unanimously to support endorsement by the American Society of Mechanical Engineers of the name of George Westinghouse for election to the Hall of Fame of New York University.

As Section 37 of the Constitution requires appointment at this meeting of the national secretary of the Institute for the year beginning August 1, National Secretary H. H. Henline was reappointed for the year beginning August 1, 1945.

The board took action removing from the active membership list the names of members in arrears for dues for the fiscal year beginning May 1, 1944, and extended the time for payment of such dues until further action by the board of directors.

The national treasurer presented a report on the financial condition of the Institute for the fiscal year which ended April 30, 1945, and the annual report of the board of directors, prepared under the direction of the national secretary, was approved for presentation at the annual meeting of the Institute in New York, on June 27, 1945.

Monthly disbursements were reported by W. R. Smith, chairman of the Finance Committee, as follows: $33,112.18 in March, $25,460.45 in April, and $30,077.42 in May.

Executive committee action on applications were reported, as follows:

As of March 22, 1945—three applicants transferred to the grade of Fellow; 34 applicants transferred and 33 elected to the grade of Member; 158 applicants elected to the grade of Associate; 99 Student Members enrolled. As of May 1, 1945—one applicant transferred to the grade of Fellow; 21 applicants transferred and 26 elected to the grade of Member; 271 applicants elected to the grade of Associate; 217 Student Members enrolled.

Recommendations adopted by the board of examiners at meetings of April 19, May 17, and May 24, 1945, were reported and approved. Upon recommendation of the board of examiners, the following actions were taken:

7 applicants were transferred to the grade of Fellow; 38 applicants were transferred and 43 were elected to the grade of Member; 310 applicants were elected to the grade of Associate; 190 Student Members were enrolled.

Those present were:

President—C. A. Powel, East Pittsburgh, Pa. *Past Presidents*—N. E. Funk, Philadelphia, Pa.; H. S. Osborne, New York, N. Y. *Vice-Presidents*—M. S. Coover, Ames, Iowa; J. F. Fairman, New York, N. Y.; W. J. Gilson, Toronto, Ont.; R. T. Henry, Buffalo, N. Y.; C. W. Ricker, New Orleans, La.; W. E. Wickenden, Cleveland, Ohio. *Directors*—P. L. Alger, Schenectady, N. Y.; K. L. Hansen, Milwaukee, Wis.; T. G. LeClair, Chicago, Ill.; F. R. Maxwell, Jr., Pensacola, Fla.; M. J. McHenry, Toronto, Ontario, Canada; S. H. Mortensen Milwaukee, Wis.; D. A. Quarles, New York, N. Y.; W. R. Smith, Newark, N. J. *National Treasurer*—W. I. Slichter, New York, N. Y. *National Secretary*—H. H. Henline, New York, N. Y.

Report of the Board of Directors

THE BOARD OF DIRECTORS of the American Institute of Electrical Engineers presents herewith to the membership its 61st annual report, for the fiscal year ending April 30, 1945. A general balance sheet showing the condition of the Institute's finances on April 30, 1945, together with other detailed financial statements, is included herein. This report contains a brief summary of the principal activities of the Institute during the year, more detailed information having been published from month to month in *Electrical Engineering*.

BOARD OF DIRECTORS' MEETINGS

The board of directors held five meetings during the year, four in New York, N. Y., and one in St. Louis, Mo. Two executive committee meetings were held.

Information regarding many of the more important activities of the Institute which have been under consideration by the board of directors and the AIEE committees is published each month in the section of *Electrical Engineering* devoted to Institute activities.

PLACES VISITED BY PRESIDENT POWEL

Alabama
Alabama Section, Birmingham

California
Los Angeles technical meeting
San Diego Section
San Francisco Section

Connecticut
Connecticut Section, New Haven

District of Columbia
Washington Section

Illinois
Chicago Section

Indiana
Central Indiana Section, Indianapolis
Fort Wayne Section
South Bend Section

Iowa
Iowa Section, Des Moines

Kentucky
Louisville Section

Louisiana
New Orleans Section

Maryland
Maryland Section, Baltimore

Massachusetts
Boston Section
Lynn Section
Worcester Section

Missouri
St. Louis Section

Montana
Montana Section { Butte / Great Falls

Nebraska
Nebraska Section, Omaha

New York
New York Section, New York
Winter technical meeting, New York
Niagara Frontier Section, Buffalo
Rochester Section
Ithaca Section

Ohio
Cincinnati Section
Cleveland Section
Columbus Section
Dayton Section
Toledo Section

Oklahoma
Oklahoma City Section
Tulsa Section

Oregon
Portland Section

Pennsylvania
Philadelphia Section
Pittsburgh Section

Rhode Island
Providence Section

Tennessee
Memphis Section

Texas
North Texas Section, Dallas
South Texas Section, San Antonio

Washington
Seattle Section
Spokane Section

Canada
Toronto Section

Mexico
Mexico Section

ANNUAL MEETING

The annual business meeting of the Institute was held Monday morning, June 26, 1944. The annual report of the board of directors for the fiscal year which ended April 30, 1944, was presented in abstract by the national secretary. In the absence of W. I. Slichter, national treasurer, H. H. Henline, national secretary, presented the treasurer's report. The report of the committee of tellers upon the election of officers for the year beginning August 1, 1944, was presented, and President-Elect Powel responded to his introduction with a brief address. Presentation of national prizes for papers presented in 1943 was made.

In addition to the presentation of the Lamme Medal to Arthur H. Kehoe, vice-president, Consolidated Edison Company of New York, Inc., the Faraday Medal of the Institution of Electrical Engineers, Great Britain, was presented by A. P. M. Fleming, Metropolitan-Vickers Electrical Company, Ltd., Manchester, England, and local honorary secretary of the AIEE for Great Britain, to Irving Langmuir, associate director of research, General Electric Company, Schenectady, N. Y., for "his outstanding contributions to electrical science." The meeting was concluded with the presidential address by N. E. Funk.

NATIONAL TECHNICAL MEETINGS

Three national technical meetings were held during the year, and a brief report on each follows:

Summer Technical Meeting. The 60th summer technical meeting was held in St. Louis, June 26–30, 1944. In addition to the annual business meeting and the conference of officers, delegates, and members, there were 28 sessions and conferences with approximately 90 technical papers and 31 conference papers. A joint luncheon meeting with the St. Louis Electrical Board of Trade featured Lieutenant Colonel T. B. Holliday, United States Army Air Forces, Wright Field, Dayton, Ohio, who gave an address entitled, "Aviation and the Electrical Engineer." The Circle Club of St. Louis sponsored a luncheon with members of the board of directors and headquarters staff as guests.

The general session was a fitting occasion to commemorate three important anniversaries in the electrical-engineering profession—the 60th anniversary of the AIEE, the 100th anniversary of the Morse telegraph, and the 40th anniversary of the International Electrical Congress, which met in St. Louis in 1904. Following the celebration of these anniversaries an address entitled "The Engineer's Present and Future Responsibilities" was delivered by William McClellan, AIEE past president and chairman of the board, Union Electric Company of Missouri, St. Louis. The registration at this meeting was 1,142.

Pacific Coast Technical Meeting. The 32d Pacific Coast technical meeting was held in Los Angeles, Calif., August 29–September 1, 1944, as the Los Angeles technical meeting, with a registration of 561. Because of the wartime situation, this meeting was largely on a local basis, and was devoted predominantly to electric equipment for military aircraft. There were 15 technical sessions on aircraft electrical developments with 58 papers and four sessions on other subjects. In the general session, J. M. Gaylord, vice-president District 8, presided, and the speakers were Brigadier General Donald F. Stace and C. A. Powel, president, AIEE, who spoke on "The Engineer and His Future." At a luncheon meeting Lieutenant Colonel Holliday gave his address on "Aviation and the Electrical Engineer."

Winter Technical Meeting. The 33d winter technical meeting was held in New York, January 22–26, 1945, with a program including 21 technical sessions, at which 80 papers were presented, and ten informal conferences. "Research and Its Effect on Winning the War" was the subject of an address by J. Carlton Ward, Jr., Fairchild Engine and Airplane Corporation, New York, at the general session. Other features of this session were presentation of the Alfred Noble prize to W. R. Wilson, General Electric Company, Schenectady, and presentation of an Honorary Member certificate to Dugald C. Jackson, AIEE past president and professor emeritus of Massachusetts Institute of Technology, Cambridge. A smoker was the only entertainment event. The registration at this meeting was 1,718.

As has been the custom in recent years a joint evening session was held with the Institute of Radio Engineers, which was meeting concurrently in New York. The first portion of this session consisted of the presentation of the Edison Medal to E. F. W. Alexanderson, consulting engineer, General Electric Company, Schenectady, N. Y. The second portion was an address delivered by Captain J. B. Dow, United States Navy, Washington, D. C., entitled "The Navy Electronics Program and Some of Its Past, Present, and Future Problems."

DISTRICT TECHNICAL MEETING

North Eastern District Technical Meeting. In compliance with the recent wartime ban on conventions this meeting, which was

Table I. Section and Branch Statistics

	For Fiscal Year Ending April 30					
	1940	1941	1942	1943	1944	1945
ections						
umber of Sections	70	72	72	73	73	73
umber of meetings held	701	703	647	598	738	884
otal attendance	91,949	92,554	78,254	66,111	83,120	96,346
ranches						
umber of Branches	121	123	124	125	125	125
umber of meetings held	1,346	1,163	946	942	755	547
otal attendance	64,972	52,285	37,785	38,227	24,768	17,132

heduled to be held in Buffalo, N. Y., pril 25–26, 1945, was canceled.

SECTIONS

1. Section Programs. The Sections gen- rally have been following a program of arrying on a reasonable amount of activity hich will be most useful to their members nd to their local communities. Consider- ble effort has been made to retain the iversified interest of the older members, as ell as to attract new and younger members. Many programs have been devoted to air ransportation, various phases of instrument anufacture and their application, the heory and application of electronics, com- unications, and other subjects closely re- ated to the war effort. In December 1944 letter was sent to all Sections calling atten- ion to the advisability of properly expand- ng Section activities so as to create addi- ional interest in AIEE within the Section erritory. Several methods which are being ost successfully used in this expansion were escribed. It was pointed out that it is ex- ected that the individual Sections will select hose additional activities which will bring to heir Section the greatest benefits for the most conomical expenditure of their available unds.

2. Sections-Committee Organization. Be- ause of the increasing volume of the Sections ommittee work, the committee was organ- zed at the beginning of the year into two roups. The planning group, consisting of ix members, initiates and develops all plans f the committee. The promotional group onsists of ten members located geographi- ally on a District basis, making it possible or its members to handle most of the pro- notional work individually with the Sec- ions. Most of the material used by the romotional group is sent to each member, who in turn supplements it with his personal nowledge of local conditions before con- acting the Sections in his District. Close ontact also is maintained between the pro- notional group member and the vice-presi- lent of the District. It is believed that this rganization provides for closer relations etween District officers and the Sections ommittee.

3. Section Finance. In co-operation vith the finance committee of the Institute, lans were formulated to provide certain ncreases in appropriations to all Sections nd additional increases to those operating ubsections and technical groups. This new lan of Section appropriations was adopted y the board of directors at a meeting held n November 2, 1944. As a result of these ncreased appropriations, many Sections ave been able to expand their programs of ctivities.

4. Technical Groups. The development of technical groups is a very important part of the plan to retain the diversified interest of the older members and to attract new members. As a result of the increased interest in the formation of these groups, the supply of the folder "Technical Groups," which was prepared by the Sections committee in January 1944, was exhausted. A revised edition of this folder was made available for distribution in January 1945. The Sections committee, through its promotional group, is making individual contacts with those Sections where there is a possibility of the successful operation of these technical groups. The possibility of forming groups on electronics, instruments and measurements, and communications have been particularly encouraged in this manner. The sections committee promotional group has also been supplying individual Sections with reports on examples of the successful operation of these technical groups. The value of such groups operated within the Section is becoming more generally recognized throughout the country. The number of these groups in active operation has increased from 27 to 51 during the year and consideration is being given by many Sections to the operation of additional groups.

5. Co-operation With Other National Committees. Certain features of the sections committee program have been closely coordinated with the finance committee of the Institute and the national membership committee. The chairman of each national committee has also been contacted in an effort to obtain the co-operation of these committees in giving active support on the development and operation of technical groups within the Sections. The members of these technical committees, working within their individual Sections, can encourage the development of technical groups corresponding to the work of their committees. They can also assist such technical groups with information on suitable programs and other information of an operating nature. In this manner, the technical committees may broaden the scope of their activities and at the same time materially assist on the technical group program of the sections committee. Several technical committees have participated actively in this program during the year, and it is believed that this work of these committees will serve as a pattern for future exploration of this field of committee co-operation, which should prove quite beneficial to the Institute in future years.

6. Subsections. Subsection operation is a valuable means of accomplishing a very important objective of the Institute by providing additional meeting places at which papers on electrical-engineering subjects may be presented and discussed. With all the territory in the continental United States allotted to the Sections, the next logical step forward in the development of Section activities is the formation of Subsections or additional centers of electrical-engineering influence. Many opportunities exist for members in remote areas of a Section territory to participate in Section activities through the development of Subsections in these areas. Subsection operation is becoming more popular each year as its advantages are more widely recognized. The number of Subsections in actual operation has been increased from 6 to 12 during the year, and several additional Subsections are in process of being formed. The Sections committee has assembled information on 43 widely distributed locations where the Sections involved are considering Subsection operation. The promotional group of the Sections committee is encouraging Sections to consider the opportunities which exist for the formation of many additional Subsections in cities which are located long distances from the regular Section meeting places. Examples of successful Subsection operation are being furnished individual Sections to give encouragement to this effort. The original Sections committee folder, "Subsections," has been rearranged and completely revised, so that it contains the latest information on the organization and operation of Subsections. This revised folder was made available for distribution in January 1945.

7. Changes in Section Territory. The following changes in Section territory were made during the year:

The assignment of the territory of the Canadian Maritime Provinces of New Brunswick, Nova Scotia, and Prince Edward Island to the Montreal (Quebec) Section was approved by the board of directors on May 25, 1944. It is believed that the assignment of this territory to the Montreal Section will lead to subsection operation in each of these Provinces.

Seven counties in the States of Indiana and Michigan in the territories of the Chicago (Ill.), Fort Wayne (Ind.), and Michigan Sections were transferred to the South Bend (Ind.) Section on approval of the board of directors on June 29, 1944. This transfer was made with the approval of all the Sections concerned in order to provide the South Bend Section with a more balanced territory.

Upon the request of a group of members at Lima, Ohio, Allen County, Ohio, was transferred from the territory of the Toledo (Ohio) Section to the territory of the Dayton Section by approval of the board of directors on January 25, 1945. This transfer had the approval of the Fort Wayne Section, and was made because the interests of the group involved were more comparable with the interests of the Dayton Section. It is quite probable that this transfer will result in Subsection operation at Lima.

The transfer of Auglaize County, Ohio, from the territory of the Fort Wayne Section to the territory of the Dayton Section was approved on February 27, 1945, by the executive committee of the Institute. This transfer was made with the approval of the Sections and the vice-presidents concerned, in order to make the territory of the Dayton Section continuous with newly acquired

Allen County. District boundary lines were changed in this transfer by removing Auglaize County from District 5 and including it in District 2.

8. Simplified Report on Section Activities. A simplified report form on Section activities was prepared and distributed to all Sections at the close of the season's activities in June 1944. A total of 71 reports were returned. This information was compiled and distributed to all Sections on a consolidated report, which provided an analysis of major activities and organization of all Sections. This report provided much information of value to the new officers in laying out their Section programs for the year. All vice-presidents, District secretaries, and the chairmen of all national committees also were sent copies of this report. Due to the wide acceptance of this report, it is planned to continue this feature at the close of the present operating year.

9. Section Operation and Management. Due to the cancellation of the summer technical meeting of the Institute, on account of the war emergency, the usual delegates meetings will not be held this year. Many plans have been considered as a substitute for these delegates meetings. It is recognized generally that any plan arranged will fall short of providing the information, enthusiasm, and inspiration which the delegates gain by the personal contacts made at the delegates meetings. The substitute plan suggests a District meeting in each District, to be held as early in the fall of 1945 as practicable. This should be at least a full-day meeting, with the morning session devoted exclusively to a clinic on Section operation and management. The vice-president of the District would conduct the clinic, and it is planned to have a representative of the Sections committee on hand at each meeting to assist in the discussions. An outline of suggested subjects, together with some information on each of these subjects, is being prepared by the Sections committee as an aid to each vice-president in conducting these clinics. Such a plan will leave the afternoon for the regular business meeting of the District committee. Some Districts also are arranging for the Section at the host city of the District meeting to hold a Section meeting on the evening of the District meeting, so that the visiting delegates could attend. Such a Section meeting would be devoted to subjects which would be most suitable for such an occasion.

10. Committee Meetings. As a result of the restrictions on travel, only one meeting of the committee was held during the year. This meeting was held on January 24, in New York during the winter technical meeting with an attendance of 26. At this meeting the entire Sections committee program was reviewed, and plans were discussed for the remaining portion of the year. Minutes of this meeting were distributed to all vice-presidents, District secretaries, and Section chairmen. Due to the nature of the Sections committee work, many of the activities of the committee are conducted by means of correspondence.

STUDENT BRANCHES

Much of the effort of the committee on Student Branches during the current year has been toward modification of the pattern of Student Branch operation. This pattern was one of proved success in normal times, but required revision to meet wartime conditions.

Student Branches, with surprisingly few exceptions, have been able to carry on during this year as in the past, but with activity and procedure limited by the more exacting obligations of Army and Navy training and other war activities. In general, the operations of individual Branches have been reasonably successful and satisfactory.

The principal omission of this year has been that of District conferences, both those held in connection with Institute conventions and independently. At a meeting of this committee, with some 30 present, held on January 23, 1945, during the AIEE winter technical meeting, it was voted after very careful study and discussion to follow the spirit of the Office of Defense Transportation restrictive travel order and to cancel all student conferences, rather than adopt a substitute program, such as that of holding a larger number of smaller gatherings, which came within the numerical limitation of the order. Later, the Institute canceled District meetings, such as that at Buffalo, in connection with which a number of student conferences were to be held.

During the year, this committee has worked with the other founder societies in exchange of information and improvement procedure through a joint committee on student activities, and has co-operated with Engineers Council for Professional Development and Society for the Promotion of Engineering Education as there was opportunity.

Particular effort has been devoted this year to the extension of Student Branch activity to every Student Member, with the slogan: "Every member working on some committee." This has been pushed to the letter devising new committees and activities to make sure that every Student Member has some part to play toward accomplishing the important Institute responsibility of developing leaders—executive as well as technical.

Toward this same end, particular emphasis has been placed on programs sponsored and carried on by the students themselves, with specific recommendations from this committee on possible symposia, joint meetings, discussion meetings under student leaders, and industrial orientation sessions presented by students with auxiliary outside help.

Table I gives information on Branch meetings in the past six years, and Table IV contains data on Student Members in the past seven years.

EMPLOYMENT CONDITIONS

The committee on collective bargaining and related matters completed a comprehensive report which was approved in principle by the board of directors. Its release for publication has been deferred by the committee with the hope that the report might be published simultaneously by several engineering societies.

Three members of this committee represent the Institute on a joint committee on the economic status of the engineer.

General Committees

FINANCE COMMITTEE

During the past fiscal year there has been a substantial gain in revenue as a result of the steady growth of Institute membership and an increasing interest in Institute publications. These important factors, together with others set forth in the detailed financial statements which appear with this report, account for the excess of income over expenditures.

Concessions to members serving in the various branches of the Armed Forces and merchant marine have been more than offset by the increase in dues revenue resulting from membership growth. Inactive status had been arranged on request for 2,259 members as of May 1, 1945, a figure comparable with 1,835 in 1944 and 771 in 1943.

All expenditures have been in accordance with the budget approved by the board of directors for carrying on effectively the activities of the Institute. The continuing favorable condition of finances has permitted assignment of $25,000 to the retirement system for members of the headquarters staff to meet the requirements of an increase in the allowance for prior services. An additional sum of $42,000 was transferred to the reserve capital fund, and $3,268 was placed in the Member-for-Life fund. All of these amounts have been invested in appropriate securities.

Schedule I presents a summary of the securities owned by the Institute and the value of these as of April 30, 1945. It will be noted that approximately 63 per cent of the investments for the reserve capital fund is in United States Government bonds. The market value of other securities is extremely favorable, and the entire schedule has had the continuing approval of investment counsel with respect to both individual items and diversification.

The Institute has for many years adhered to the policy of budgeting Institute expenditures within the total of anticipated revenue, estimated on a conservative basis. This has insured a sound financial condition at all times, exceptionally so at present because of the influence of the increase in membership and other factors previously mentioned. The opportunity thus has been afforded to strengthen the reserve fund and provide for the continuance at a proper level of essential Institute activities in those years when income may be reduced below an essential amount as a consequence of economic conditions or other at present unpredictable developments.

TECHNICAL-PROGRAM COMMITTEE

Technical Meetings. With the cancellation of the spring District meeting, only three technical meetings—the summer, Los Angeles, and winter—were held during the year. The total registered attendance at these three meetings was 3,415, which exceeded the total registration of 3,030 for the three corresponding meetings of the previous year and represents a 12.7-per-cent increase in attendance. More technical papers were presented, and more technical sessions were held than at any time during the past five years. Statistics are given in Table II covering the five-year period. In recognition of the importance of the aircraft industry on the Pacific Coast, the program for the Los Angeles meeting included 15 aircraft sessions and 58 papers on electrical applications to aircraft in addition to four sessions outside the aircraft field. Notwithstanding the limitation on attendance by distant members

Table II. Statistics of Technical Programs for Last Five Years

	For Fiscal Year Ending April 30				
	1945	1944	1943	1942	1941
Number of national technical meetings	3	3	3	3	3
Number of District technical meetings	0	2	2	3	2
Registration at national meetings and District meetings	3,415	3,880	3,497	4,274	4,339
Number of papers presented	250	196	168	182	195
Number of papers recommended for *Transactions*	224	153	141	152	167
Estimated number of pages required for printing papers in *Transactions*	1,286	875*	886*	807*	932*
Average length of papers recommended for *Transactions* (pages)	5.74	5.72	6.28	5.3	5.72
Number of technical sessions	64	53	44	50	46
Number of technical conferences	15	24	24	23	18

* Partly estimated.

mposed by the acute travel congestion, a egistration of 561 represented the highest ver obtained for a Pacific Coast meeting.

Wartime Programs. In accordance with he wartime policy adopted by the board of directors, the committee has continued to ive preference to papers which aid in the var effort. In addition to the Los Angeles program, the St. Louis meeting program had our aircraft sessions, with 17 papers, and he New York meeting had two aircraft essions, with nine papers. Of the total number of papers recommended for the AIEE *Transactions* 37.5 per cent were in the ield of air transportation.

In the industrial field papers of aid to war work have come to the fore. Some of these papers have dealt with industrial-plant distribution systems and power recovery from airplane-engine testing, electric equipment for the propeller milling machine, industrial control, electric welding, and induction and high-frequency dielectric heating. The latter subject has many wartime applications, particularly in the synthetic products industries.

General Sessions. The general sessions have continued to deal with the broader aspects of the profession, at the summer technical meeting with the commemoration of three important anniversaries, at the winter technical meeting with the effect of research on the war.

Technical Conferences. Although technical conferences held have been fewer than during previous years, several conferences have presented subject matter important in the war effort. At the winter technical meeting, conferences were held on the subjects of wartime practices on distribution systems and their effect on system operation and future designs, air transportation, high-frequency dielectric heating, and high-frequency cables. The latter conference was an all-day meeting sponsored with the cooperation of the Army–Navy Radio-Frequency Cable Co-ordinating Committee, Lieutenant Commander John H. Neher presiding.

Committee Policies. The cancellation of all Institute and District meetings scheduled in 1945 following the winter meeting necessitated the adoption of a modified plan for the technical programs which normally would have been scheduled for those meetings. Under the new plan papers will be presented by publication with preprints made available and discussion submitted in writing as in the past. The papers for the year will be arranged in three programs for the spring, summer, and fall. The general plan was approved by the executive committee on February 27.

Table III. Statistics on Meetings

	Registration Attendance	Number of Papers	Number of Transactions Papers	Estimated Number of Pages	Number of Sessions	Number of Conferences
Technical Meetings						
St. Louis	1,142	89	85	514	21	5
Los Angeles	561	74	60	348	20	
New York	1,712	87	79	424	23	10
	3,415	250	224	1,286	64	15
Aircraft Sessions						
St. Louis		17			4	
Los Angeles		58			15	
New York		9			2	
		84			21	

Per cent aircraft papers recommended for *Transactions* = $\frac{84}{224} = 37.5$

To minimize time and travel the committee has continued the policy of the past year, holding one meeting in the fall and another in the spring. The fall meeting was attended by 79.3 per cent of the committee members or duly appointed representatives, as compared with an attendance of 76.6 per cent for the corresponding meeting of the previous year. Much of the work has been conducted through correspondence.

PUBLICATION COMMITTEE

As in previous wartime years, war problems continued to hold first place in the Institute's technical publications during the year. Expected developments in the postwar period also received attention through the medium of a special series of articles appearing monthly in *Electrical Engineering*, beginning with the May 1944 issue and continuing through the entire year. Publication policies and procedures remain unchanged. Although the wartime ban on meetings, which became effective February 1, 1945, will have considerable influence on the handling of technical-program papers and discussions, it necessitated no change in publication procedure, and publication of this material will continue as scheduled insofar as approved papers and discussions are available.

Restrictions on magazine paper continued as in the preceding year, allowing the use in *Electrical Engineering* of 75 per cent (on a tonnage basis) of the paper used during the calendar year 1942, plus a token increase in quota of four tons annually granted by the War Production Board in June 1944 (present annual quota with this increase—112 tons). Further restrictions were imposed which resulted in the use of a lighter-weight paper. This lighter stock, of course, allows more pages of material to be published within the same tonnage limitations. The following tabulation shows the approximate number of words published in the three major divisions of *Electrical Engineering* during the years 1940–44.

Year	News	General-Interest Articles	Transactions Sections (Technical Papers)
1940	332,000	275,000	587,000
1941	426,000	296,000	517,000
1942	445,000	270,000	653,000
1943	357,000	266,000	546,000
1944	323,000	265,000	702,000

In accordance with present publication policies, the 1944 *Transactions* volume contains all approved 1944 technical papers and related discussions. Two semiannual "Supplements to *Electrical Engineering*—Transactions Section" were produced, on the usual limited-edition advance-order basis, containing

1. Technical papers that could not be accommodated in the monthly Transactions sections of *Electrical Engineering*.
2. All approved discussions.

The greatly expanded technical-paper program during 1944 required publication in the *Transactions* of a correspondingly expanded amount of papers and discussions. The total number of *Transactions* pages for the year was 1,558 as compared with 1,044 for 1943. Of this total, 1,272 pages were technical papers, 778 pages of which were included in the 12 monthly Transactions sections of *Electrical Engineering;* comparable figures for 1943 were 816 and 634 pages, respectively. Thus, the proportion of the year's technical-program papers included in *Electrical Engineering* in 1944 was less than in previous years, although more pages of such material were published therein than in previous years.

After an attempt to obtain a substantially increased quota of magazine paper in order to include more of the 1944 technical papers in *Electrical Engineering* had failed several additional economies in the use of paper were adopted. In the general section, the size of type was reduced and a three-column format adopted in place of the former two-column arrangement. At the same time, in the Transactions section the spacing between lines was reduced. It is believed that these economies will not impair seriously the readability of the material.

As an additional measure to conserve magazine paper, the annual index pamphlet for 1944 (covering both *Electrical Engineering* and *Transactions*) was not published as a second section of one of the monthly issues. Copies of the index were distributed to all members of all technical committees and to all subscribers to both *Electrical Engineering* and the supplements. Copies were made available to all others without charge upon written request.

Advance pamphlets of approved technical papers were produced as required by the technical-program committee for the national

and District meetings held during the year and for discussion by mail during the spring of 1945 after the cancellation of meetings. The booklet, "Information for Authors," was reprinted, the previous supply having become exhausted. Although the present edition is somewhat out of date, revision was deferred so as to avoid having the booklet out of stock over an extended period. Revision is planned within the next year.

Publication of the quarterly AIEE *Bulletin* for Institute members in the armed services and the merchant marine, initiated in June 1943, was continued throughout the year. This consists of a four-page pamphlet and includes news of the Institute and related items that are considered of interest to these members. More than 2,000 copies of each issue now are being produced and distributed to members on all the fighting fronts.

Governmental censorship regulations were maintained during the year, although the procedure was changed. The censorship regulations now are applied entirely on a voluntary basis by the staff, and only material that is considered censorable is submitted to the Office of Censorship for advance review. Advance proofs of publications intended for export no longer are required, although all publications exported still are subject to inspection by the postal censors. As in the past, full co-operation has been extended to, and has been received from, the Office of Censorship.

MEMBERSHIP COMMITTEE

The Institute membership has continued its upward trend, and attained a total of 23,072 as of April 30, 1945. This compares with a total of 21,407 as of April 30, 1944. A net increase of 1,665 has been obtained in comparison with the net increase in 1943–44 of 1,246, and it is the largest increase in any one year in the history of the Institute with exception of the year 1920–21.

A total of 2,259 persons now are maintaining an "inactive status" because of military service or residence in Allied countries with which financial transactions are difficult. This is an increase of 424 over that of last year. There are, however, only 902 members in arrears for dues for the fiscal year ending April 30, 1945, as against a total of 1,288 last year. Incidentally, this is the lowest number of members in arrears at the end of any fiscal year for over 18 years and represents only 3.8 per cent of the total membership.

Tables IV, V, VI, VII and VIII outline certain statistical data relative to membership matters.

Table IV gives the data relative to the various grades of membership in the Institute, the additions, the deductions, and the net changes for the year 1944–45. In every instance, with the exception of the matter of deaths, the figures are on the favorable side. The number of members dropped represents a decrease of 323. The number of those reinstated or re-elected represents a gain of 65. The number of new members qualified represents a gain of 29. The number of transfers represents a gain of 88. The membership is divided as follows:

Member Grade	Per Cent
Honorary	0.03
Fellow	3.96
Member	27.03
Six-Year Associate	30.19
Associate	38.79
	100.00

The Member and Associate grades have increased 0.73 and 0.39 per cent, respectively, while the six-year Associate and Fellow grades have decreased 1.01 and 0.11 per cent, respectively. The six-year Associate grade of membership continues to be a large source of possible transfer to Member grade.

Table V shows a decline in applications from "Student Members" which is continuing as against the upward trend in applications from "All Others." No direct comparison between this table and Table VI can be made, since not all applications received during the fiscal year are acted upon before the close of the fiscal year.

Table VI gives the data on the number of applications received for Student membership. Prior to 1945, this group was known as Enrolled Students. It will be noted the "New Applications" have started an upward trend and that there has been a marked reduction in the downward trend of "Renewals." These favorable results were entirely unexpected,

Table VII is a record of the total membership of the Institute by years since 1884 and is given for information purposes.

Table VIII is the customary listing of the deaths of AIEE members as reported in *Electrical Engineering*. By this means the membership committee makes a record of the completed careers of those members taken from the ranks by the Great Reaper.

The preparation of additional material for use by the membership committee generally in interesting persons in membership in the Institute is being undertaken. This is the result of information obtained from various sources indicating a need in that direction.

As a result of requests from Section membership committee chairmen and others, a plan was introduced for sending a reprint

Table V. Number of Applications Received From Student Members and From All Others

Year Ending April 30	Students	All Others	Total
1945	249	2,179	2,428
1944	466	1,908	2,374
1943	783	1,431	2,214
1942	971	1,031	2,002
1941	887	1,011	1,898
1940	911	918	1,829
1939	849	872	1,721

Table VI. Number of Student Members as of April 30

Year	New Applications	Renewals	Total
1945	2,326	2,287	4,613
1944	2,242	2,656	4,898
1943	2,512	3,200	5,712
1942	2,585	3,377	5,962
1941	2,351	3,188	5,539
1940	2,525	2,992	5,517
1939	2,271	2,971	5,242

Table IV. Membership Statistics for Fiscal Year Ending April 30, 1945

	Honorary Members	Fellows	Members	Six-Year Associates	Associates	Subtotals	Totals
Membership April 30, 1944	6	872	5,632	6,659	8,238		21,407
Additions							
New members qualified			252		1,749	2,001	
Former members reinstated or re-elected		1	139	83	143	366	
Subtotals		1	391	83	1,892	2,367	
Transfers	1	67	396	873		1,337	
Totals	1	68	787	956	1,892	3,704	
Deductions							
Died	1	19	44	52	10	126	
Resigned		3	19	59	42	123	
Dropped		3	51	189	210	453	
Subtotals	1	25	114	300	262	702	
Transfers		1	67	352	917	1,337	
Totals	1	26	181	652	1,179	2,039	
Net changes		42	606	304	713	1,665	
Membership April 30, 1945	6	914	6,238	6,963	8,951		23,072

Table VII. Record of AIEE Membership

Year	Total May 1	Year	Total May 1	Year	Total May 1
1884	71	1905	3,460	1925	17,315
1885	209	1906	3,870	1926	18,158
1886	250	1907	4,521	1927	18,344
1887	314	1908	5,674	1928	18,269
1889	333	1909	6,400	1929	18,133
1890	427	1910	6,681	1930	18,003
1891	541	1911	7,117	1931	18,339
1892	615	1912	7,459	1932	17,558
1893	673	1913	7,654	1933	17,019
1894	800	1914	7,876	1934	15,238
1895	944	1915	8,054	1935	14,269
1896	1,035	1916	8,202	1936	14,606
1897	1,073	1917	8,710	1937	15,301
1898	1,098	1918	9,282	1938	16,078
1899	1,133	1919	10,352	1939	16,605
1900	1,183	1920	11,345	1940	17,213
1901	1,260	1921	13,215	1941	17,888
1902	1,549	1922	14,263	1942	18,944
1903	2,229	1923	15,298	1943	20,163
1904	3,027	1924	16,455	1944	21,407
				1945	23,072

he postings in *Electrical Engineering* to each licant for membership whose name appears therein, together with a statement from membership committee outlining the time nents to be expected prior to the taking final action on the application by the rd of directors. This plan, while introing some additional expenditure for nbership activity, is considered to be ified, since the applicant is kept informed the progress of the application and a ord of the actual posting of applicant's ne is given the applicant.

These membership data are almost enly without an unfavorable aspect. It is that reason that there is a considerable ree of satisfaction in presenting them. of this has been made possible by the ndid response from the individual mems of the Institute, the intensive continuous rt of the Section membership committee sonnel, the membership committee Dist vice-chairmen, and the other members he national membership committee.

BOARD OF EXAMINERS

The board of examiners held 12 meetings ing the past year, averaging about 2¾ rs each, and acted upon 4,693 cases ded as shown in Table IX. The number of cases for both direct admission and transfer to Member and Fellow grades has been showing a steady increase during the past two years, the increase being 28 per cent in 1943–44, and 23 per cent this past year.

In 1943 a subcommittee was appointed to study the constitutional requirements for Fellow grade. Following conferences with the committee on constitution and bylaws, which also had those requirements under consideration, a final report was submitted this year and approved by the board of directors. The recommendations are now out to letter ballot of the membership. As finally submitted, no changes in substance of requirements are recommended, the proposed alterations and rearrangements of wording being for clarification only.

COMMITTEE ON MEMBERS-FOR-LIFE FUND

This committee was authorized by the board of directors in January 1944, and appointed by the president, to administer the fund established at the same time by turning into it all monies received from the members for life who voluntarily continue to pay their accustomed annual dues, even though no longer obligated to do so. The fund and its proceeds are to be used only for such special purpose or purposes as will aid the attainment of the objectives of the Institute.

After considering many possible applications of this fund, the one finally agreed upon was the payment of the expenses to the summer convention of the winners of the District awards, formal announcement of the details of which was made in the February 1945 issue of *Electrical Engineering*.

COMMITTEE ON CONSTITUTION AND BYLAWS

During the year the committee submitted a number of proposals for amendments to the constitution and to the bylaws. On June 29, 1944, the board of directors approved an amendment to the constitution eliminating the word "national" from the titles of officers and names of committees and meetings wherever it occurred.

On January 25, 1945, the board of directors approved amendments to the constitution

1. Improving the wording of Article III, Section 10, as regards references for an applicant for admission or transfer.

2. Clarifying and putting in more concise wording Section IV, Article II, covering the requirements for the grade of Fellow.

At the January 25, 1945 meeting, the

Table VIII. Deaths of AIEE Members Reported in "Electrical Engineering"

Name	Date of Election	Date of Death	Grade at Death	Obituary Notice in "Electrical Engineering"
rt, J. C.	A '10	Jan. 16, '45	M	Apr. '45, p. 164
strong, A. H.	A '98	May 31, '44	M	Aug. '44, p. 317
ns, C. G.	A '01	Oct. 20, '44	M	Feb. '45, p. 78
J. D.	A '11	Feb. 10, '45	F	Apr. '45, p. 163
antine, Stuart	M '42		M	Oct. '44, p. 386
, Leo	A '29	June 25, '44	A	Dec. '44, p. 450
man, S. R.	A '04	Nov. 25, '44	A	Jan. '45, p. 41
s, Philander	A '96	Feb. 6, '45	F	Mar. '45, p. 126
ord, J. T.	A '23	July 10, '44	A	Oct. '44, p. 386
, W. L.	A '94	Dec. 5, '44	F	Feb. '45, p. 78
len, N. S.	A '09	Sept. 27, '44	M	Dec. '44, p. 450
vn, H. A.	A '16	Feb. 25, '45	M	Apr. '45, p. 163
apbell, John	A '04	Mar. 6, '44	A	May '44, p. 193
efield, C.E.	A '25	July 23, '44	A	Sept. '44, p. 343
penter, L. S.	A '20	Apr. 20, '44	A	July '44, p. 272
in, Leroy	A '37	Nov. 16, '44	M	Feb. '45, p. 78
, C. E.	A '27	Mar. 19, '44	A	July '44, p. 272
rad, L. L.	A '36	Apr. 6, '44	M	July '44, p. 272
eland, C. A.	A '97	Aug. 18, '44	F	Nov. '44, p. 415
E. H.	A '41	July 6, '44	A	Oct. '44, p. 386
nley, T. R.	A '19	Oct. 5, '44	A	Feb. '45, p. 78
rall, S. S.	A '41	Sept. 1943	A	July '44, p. 271
s, C. M.	A '43	Apr. 27, '44	A	July '44, p. 272
, N. A.	A '36	Aug. 8, '44	A	Nov. '44, p. 416
rning, P. M.	A '98	Dec. 11, '44	F	Feb. '45, p. 77
ards, J. B.	A '29	Feb. 5, '44	A	May '44, p. 193
nton, W. M.	A '03	Aug. 4, '43	A	July '44, p. 271
tt, D. A.	A '28	July 31, '44	A	Sept. '44, p. 343
er, Henry	A '37	June 16, '44	A	Dec. '44, p. 450
ua, H. E.	A '42	Feb. 23, '44	A	Oct. '44, p. 385
dner, J. H.	A '25	Oct. 11, '44	M	Dec. '44, p. 450
J. H.	A '12	June 16, '44	A	Aug. '44, p. 317
el, F. C.	A '05	Sept. 16, '44	A	Mar. '45, p. 127
at, L. T.	A '99	July 15, '44	M	Nov. '44, p. 415
y, C. D.	A '02	Mar. 29, '44	F	May '44, p. 193
en, D. C.	M '26	July 2, '44	M	Nov. '44, p. 416
ene, C. E.	M '31	Mar. 8, '44	M	May '44, p. 193
million, B. X.	M '41	May 28, '44	M	Aug. '44, p. 317
ry, Maxwell	M '32	Apr. 7, '44	M	June '44, p. 236
t, Alf.	M '21	Dec. 12, '44	M	Feb. '45, p. 77
gh, H. W.	A '08		M	June '44, p. 236
bard, F. A.	M '23	Nov. 6, '44	M	Jan. '45, p. 41
er, H. L.	M '23	Feb. 4, '45	M	Mar. '45, p. 126
ley, G. W.	A '94	Apr. 8, '44	F	June '44, p. 236
hes, G. A.	A '17	Sept. 9, '44	A	Mar. '45, p. 127
m, D. L.	A '41	Apr. 10, '44	A	July '44, p. 272
bert, F. W.	A '04	Dec. 4, '44	A	Feb. '45, p. 78
son, W. A.	A '18	June 1, '44	M	Aug. '44, p. 318
ry, J. A.	M '20	Dec. 26, '44	M	Feb. '45, p. 77
e, R. D.	A '40	July 27, '44	A	Oct. '44, p. 386
, W. deY.	A '16	Jan. 31, '44	A	July '44, p. 272
ch, R. S.	A '02	Feb. 4, '45	F	Apr. '45, p. 163
Levy, C. C.	A '33	June 5, '44	A	July '44, p. 272
Lewis, D. L.	A '25	July 28, '44	A	Oct. '44, p. 386
Lincoln, P. M.	A '95	Dec. 20, '44	F	Feb. '45, p. 76
Louttit, W. C.	M '31	July 9, '44	M	Sept. '44, p. 343
Lovewell, E. B.	M '43	Nov. 1943	M	July '44, p. 272
Manson, G. K.	A '09	Jan. 6, '45	F	Apr. '45, p. 163
Marshall, A. C.	A '14	Feb. 9, '45	F	Apr. '45, p. 163
Merrick, F. A.	A '07	Oct. 26, '44	A	Dec. '44, p. 450
Meyer, J. F.	A '08	Oct. 30, '44	M	Mar. '45, p. 126
Mowbray, W. J.	A '03	July 4, '44	F	Sept. '44, p. 343
Newman, W. L.	M '35	Oct. 31, '44	M	Feb. '45, p. 78
Northup, V. E.	A '39	Feb. 4, '44	A	June '44, p. 236
O'Donnell, C. E.	A '32	Oct. 3, '44	A	Dec. '44, p. 450
Oklund, A. L.	A '35	Aug. 19, '44	M	Nov. '44, p. 416
Pearson, E. R.	A '06		M	June '44, p. 236
Peterson, J. A.	A '37	July 13, '44	A	Oct. '44, p. 385
Pierce, D. A.	A '21	June 28, '44	M	Oct. '44, p. 386
Powell, F. H.	A '08	Dec. 11, '43	A	May '44, p. 193
Pratt, L. W.	A '38	Oct. 3, '44	A	Dec. '44, p. 450
Price, R. D.	A '44	June 24, '44	A	Sept. '44, p. 343
Osborne, L. A.	A '93	Aug. 18, '44	F	Oct. '44, p. 386
Randall, K. C.	A '02	Dec. 4, '44	M	Mar. '45, p. 127
Reber, H. L.	A '03	Nov. 1, '44	E	Jan. '45, p. 41
Roberts, C. J.	A '22	June 26, '44	A	Dec. '44, p. 450
Rosenthal, L. W.	A '02	Jan. 8, '45	F	Feb. '45, p. 77
Sands, H. S.	A '06	Dec. 13, '44	M	Feb. '45, p. 77
Sanford, W. J.	A '23	Dec. 23, '43	A	July '44, p. 272
Schattner, Ernest	A '06	Feb. 13, '44	M	May '44, p. 192
Schoonmaker, C. F.	A '12	Feb. 20, '44	M	May '44, p. 192
Schou, Theodore	M '14	Nov. 16, '44	M	Feb. '45, p. 78
Scott, C. F.	A '92	Dec. 17, '44	HM	Jan. '45, p. 41
Sinks, A. T.	A '36	Aug. 3, '44	M	Oct. '44, p. 386
Skone, R. C.	A '19	Aug. 14, '44	M	Oct. '44, p. 386
Smith, H. L.	M '36	Apr. 7, '44	F	July '44, p. 272
Smith, J. B.	A '24			June '44, p. 236
Stockman, E. O.	A '39		A	Dec. '44, p. 450
Tadlock, W. L.	A '29	Nov. 27, '44	M	Feb. '45, p. 77
Teach, F. A.	A '24	Oct. 25, '44	M	Feb. '45, p. 78
Teker, Louis	A '26	June 11, '44	A	Aug. '44, p. 318
Tower, L. W.	A '36		A	Nov. '44, p. 416
Troy, M. O.	A '08	Mar. 13, '44	M	May '44, p. 192
Turnock, H. C.	A '16	June 4, '44	M	Oct. '44, p. 385
Varney, Theodore	A '05	Oct. 2, '44	A	Feb. '45, p. 78
Vergilio, J. L.	A '41	Oct. 17, '44	A	Mar. '45, p. 127
Warren, H. M.	A '03	Feb. 3, '45	A	Apr. '45, p. 163
Whitaker, S. E.	A '96	Aug. 10, '44	M	Nov. '44, p. 415
Willison, J. W.	M '26	Dec. 16, '44	M	Mar. '45, p. 127
Wilson, A. M.	A '09	Aug. 23, '44	M	Mar. '45, p. 127
Winslow, C. G.	A '02	Mar. 9, '44	A	May '44, p. 193
Wood, H. G.	A '23	Apr. 4, '44	M	June '44, p. 236
Woodward, A. C.	A '18	July 17, '44	A	Oct. '44, p. 386
Wright, M. L.	A '25	Aug. 9, '44	A	Nov. '44, p. 416

board of directors also approved the following amendments to the bylaws

1. Sections 51, 52, 53, 54, 55, 56, 57, 60 and 64, changing the designation "Enrolled Student" to "Student Member."

2. Section 65, changing the title of "committee on electrical machinery" to "committee on electric machinery" to conform to the American Standard, "Definitions of Electrical Terms."

The committee has under consideration a proposal for amending Section 51 of the bylaws to define "a university or technical school of recognized standing" in terms of the ECPD accrediting program.

The committee also is considering the matter of amending Section 27 of the bylaws to give the board of directors proper backing for its action in eliminating the 1945 summer meeting at the request of the Office of Defense Transportation.

COMMITTEE ON PLANNING AND CO-ORDINATION

The most important matter on which this committee took action was that brought about by the request of the Office of Defense Transportation that all conventions or meetings at which the out-of-town attendance would be greater than 50 people should be canceled, unless the war effort would be injured by the elimination of the meeting. After thorough consideration of all the activities affected, the committee was unanimous in recommending to the board that both the summer technical meeting and the North Eastern District meeting be canceled. This action was taken with the understanding that the technical committees would continue to secure papers, publish preprints, and obtain discussions so that the technical work of the Institute could be carried forward in much the same manner as though the papers actually would be presented in fact. Because of the possibility of change in conditions, the committee did not recommend the cancellation of the Pacific Coast technical meeting.

The board of directors referred to this committee the problem of obtaining more satisfactory publicity for Institute activities. Due to its action in recommending the cancellation of meetings, the committee considered it unwise to attempt to pursue this subject any further at present and recommended to the board that the matter be held in abeyance until conditions were more favorable.

The finance committee presented a resolution which was suggested for adoption by the board of directors to extend the period for Student Members in the Armed Forces and the merchant marine to continue on the inactive basis, which was to replace a similar resolution expiring January 28, 1945. The committee unanimously voted to recommend the adoption of this resolution to the board.

The board took affirmative action on all the recommendations of this committee except that for the Pacific Coast technical meeting, which was referred to the executive committee for further action.

COMMITTEE ON RESEARCH

Research under the auspices of the committee on research continues to be hampered by the fact that substantially all of the research facilities normally devoted to fundamental projects which would usually be fostered by this committee still are devoted to urgent war projects arranged by Government war agencies. The activities of the committee therefore are devoted largely to the preparation of a postwar research program which could be put into effect rapidly, as soon as normal conditions are restored. All the AIEE technical committees are informed of this program, and suggestions have been requested. Information on the procedure by which projects are formulated and presented to the Engineering Foundation for sponsorship and support was given to the technical committee representatives.

At the January meeting of the committee on research, it was recommended that the lists of research projects prepared in 1934, 1935, and 1937 be brought up to date with the revisions of the original subjects to take account of the progress made in the meantime and new projects added as suggested by present knowledge. It was proposed further that these lists be given broader circulation by having them distributed not only to heads of engineering departments in the colleges but also by sending them to engineering experiment stations and commercial and industrial research stations, which are frequently desirous of undertaking research on fundamental problems. Copies also should be available to interested persons other than those listed, and notice of the availability of the lists should be published in *Electrical Engineering*.

COMMITTEE ON SAFETY

Two meetings were held by the committee on safety during the past year, the first of which was a breakfast meeting during the summer technical meeting in St. Louis on June 26, 1944. At this meeting emphasis was placed on the importance of the committee's efforts to promote interest in safety educational work and safety procedure in the Student Branches, and steps were taken to bring together the points of view of the Counselors and others who might give helpful suggestions in this connection. Professor Albrecht Naeter accepted sponsorship for this activity and subsequently submitted a report which will be used in carrying the matter forward. There was a general discussion of the following items:

1. Electrical hazards to farm animals, on which W. B. Buchanan, a member of the committee on domestic and commercial applications, was submitting a paper at the June 29 session.

2. Static electricity, on which subject the committee will at an appropriate time arrange for a conference discussion at a technical meeting.

3. The report on fatalities in the electric-light-and power industry as prepared by the Edison Electric Institute accident prevention committee.

The chairman called attention to the report which was made by the conference committee on operating-room hazards of the National Fire Protection Association to the 48th annual meeting of that association held in Philadelphia, Pa., May 8–11, 1944. This report appears on pages 74 to 88 in part 2 of the *Quarterly* of the NFPA dated April 1944. W. Weinerth represented the chairman at this meeting.

The second meeting was held during the winter technical meeting in New York, on January 23, 1945. Thirty-seven members and guests were present. At this meeting, Cecil K. Drinker, professor of physiology, School of Public Health, Harvard University, presented an important discussion of the subject "The Use of Drugs in Resusci tation from Electric Shock." C. F. Dalziel a member of the committee, and now tech nical aid, National Defense Research Com mittee, summarized for the committee the research work on electric shock carried o under his direction at the University o California, Berkeley. There was a genera discussion of the subject of grounding o circuits operating at voltages in excess of 15 volts from the standpoint of hazard to per sonnel. The chairman announced that ar rangements had been made with the edito of *Electrical Engineering* to have a news colum appear under the heading "Safety Notes whenever suitable material was available with the expectation that this eventuall would be a regular feature.

The annual meeting of the National Fir Waste Council which was held in Philade phia on April 13 was attended by R. I Lloyd, who represented the chairman an the Institute. The appointment of an offici executive committee of the Council wa authorized. The committee on safety wi consider ways in which it may be helpful i promoting the Council's objectives and wi submit suggestions through the Institute representatives.

Table IX. Applications for Admission and Transfer, 1944–1945

Applications for Admission		
Recommended for grade of Associate	1,682	
Re-elected to the grade of Associate	140	
Not recommended	2	
		1,82
Recommended for grade of Member	353	
Re-elected to the grade of Member	27	
Not recommended	65	
		44
Applications for Transfer		
Recommended for grade of Member	419	
Not recommended for grade of Member	15	
		43
Recommended for grade of Fellow	63	
Not recommended for grade of Fellow	0	
		6
Students		
Recommended for enrollment as Students		1,92
Total		4,69

Standards

STANDARDS COMMITTEE

Due to restrictions placed on wartim travel, the Standards committee held on two meetings. The work of the committe itself, as well as its many co-operating com mittees and subgroups, however, has bee prosecuted actively by correspondence an by conferences of local groups.

An indication of the widening scope AIEE standardizing activities is illustrat in the list of the following projects appearin on the standards agenda since the last repo "Guiding Principles for the Specifications Service Conditions," "Guiding Principles the Selection of Test Voltages," "Test Co for Low-Frequency, D-C, and Impulse Te ing," "Preferred Standards for Large 3,6 Rpm Condensing-Type Turbine Gene tors," "Standard Specifications for Gene tors for Large 3,600 Rpm Condensing-T Turbine Generators," and, finally, standa

tion of aeronautical electric equipment. Among the AIEE and American standrds, revisions of which were consummated uring the year, were: "Automatic Staons," "Lightning Arresters," "Insulator ests," "Fuses Above 600 Volts," "Test ode for Synchronous Machines," and General Standards for Wires and Cables."

Due largely to shifts brought about by artime conditions, it has been necessary to ake a large number of new appointments Institute representatives serving on various ctional committees of the American Standrds Association.

Participation by the Institute in the delopment of fundamental electrical standrds in the aeronautical field is rapidly going rward under the control of the committee n air transportation, and guidance of an nstitute liaison representative, with such her interested groups as the Society of utomotive Engineers, the National Aircraft tandards Committee, the Army Air Forces, ne Bureau of Aeronautics, and National lectrical Manufacturers Association. Sevral subcommittees of the committee on air ansportation are projected, and one o f ese on aircraft electric rotating machinery as completed a proposed standard which is ow in process of publication.

In view of the widespread interest in the bject of application of statistical methods engineering and manufacturing, the tandards committee appointed a subommittee to explore the possible applicaons in the Institute's field and to ascertain ne reaction of the membership.

In order to reach a conclusion, the subommittee has set down a plan of work for ne coming year embracing the following ctivities:

An educational program including:

). A series of short technical articles developing the bject from first principles.

). Articles describing special applications of statistical ethods.

. The sponsoring of conferences and technical sesns and of the presentation of papers at Section, Disct, and national meetings.

). General articles addressed primarily to executives, inting out the advantages of statistical methods.

A study of applications in Institute test codes and andards.

Applications in the electrical utility fields.

Co-operation with Joint Committee on Application Statistical Methods in Engineering and Manufacring.

Keeping in touch with developments in which the stitute might properly co-operate.

NITED STATES NATIONAL COMMITTEE OF HE INTERNATIONAL ELECTROTECHNICAL COMMISSION

During the past year, as in the preceding ar years, the work of the International ectrotechnical Commission and the United ates National Committee has remained in state of suspension. It is not contemplated at work will be resumed until after the ace is concluded.

At its annual meeting on November 10, 44, the United States National Committee -elected E. C. Crittenden, president; L. F. lams, vice-president; and H. S. Osborne, ce-president and treasurer.

During the year there was set up a United ational Standards Co-ordinating Comttee, with the national standardizing dies of Great Britain, Australia, Canada, w Zealand, South Africa, Brazil, China, ance, and the United States as members. Offices have been set up in London, England, under the direction of C. Le Maistre, who is also general secretary of the IEC, and in New York under the direction of H. J. Wollner. Participation in the United Nations Standards Co-ordinating Committee is limited to those countries which are participating on a positive scale in the war effort of the United Nations. A number of proposals for international standardization work have been made, and the work of the committee can now be considered to be well under way. The committee was organized with the understanding that it would operate for only two years, leaving the form of future international organization to be determined later.

Technical Committees

COMMITTEE ON AIR TRANSPORTATION

The past year has been a period of major activity in the field of aircraft electric applications. A large number of technical papers were presented at three national meetings, and an extensive program has been undertaken in respect to aircraft electrical standards.

At the 1944 summer meeting in St. Louis, four of the technical sessions were devoted to aircraft subjects; a total of 17 papers were presented.

At the Pacific Coast technical meeting in Los Angeles, in August, aircraft electrical subjects and technical sessions occupied the dominant place. Fifteen of the technical sessions were concerned with aircraft problems, and 58 technical papers were presented and discussed.

At the winter technical meeting in New York, aircraft electrical problems occupied an important part of the program, and, in view of the restriction on the total number of papers and sessions which could be handled, there were two technical sessions at which nine papers were presented and one conference session covering the general problems of application of electric devices to military and commercial aircraft.

The committee met twice during the year on the occasions of the Los Angeles and New York technical meetings.

A "Report on Proposed Standard for Aircraft D-C Apparatus Voltage Ratings" was approved by the committee and recommended for publication for one year's trial use. This report has been in the process of preparation for the past two years, and, although some further revisions are probable, it is believed that adherence to the recommendations will result in improved operation of electric equipment in aircraft.

During the year, the committee has been in close contact with the SAE, NASC, NEMA, AAF, and the Navy Bureau of Aeronautics to assist in the formulation of appropriate technical standards. To carry out this work, four subcommittees were formed with assignments as follows:

1. Aircraft Electric System Subcommittee. To prepare an informative type of report on "Fundamental Characteristics of Aircraft Electric Systems." This subcommittee has made considerable progress in the preparation of a comprehensive outline and already has received from various sources some draft contributions.

2. Aircraft Electric Control and Protective Devices Subcommittee. To prepare electrical standards and test codes covering aircraft control and protective devices to aid in the rating, testing, and application or evaluation as such for aircraft service.

3. Aircraft Wire and Cable Subcommittee. The preparation of electrical standards and test codes covering the rating and testing and application of aircraft wires and cables.

4. Aircraft Electric Rotating Machinery Subcommittee. The preparation of electrical standards, tests, codes, and definitions for aircraft electrical rotating machinery. Immediate attention is being given by this subcommittee to the formulation of a suitable test code for aircraft d-c machines.

Consideration is being given to the formation of a subcommittee on brushes and brush test codes sponsored jointly by the committee on electric machinery and the committee on air transportation. It is believed that such a group can render worth-while service.

COMMITTEE ON AUTOMATIC STATIONS

The committee on automatic stations held two meetings during the year, one in Buffalo following the summer technical meeting, and one in New York during the winter technical meeting.

One of the principal matters discussed at these meetings concerned the revision of the "American Standard for Automatic Station Control, Supervisory and Telemetering Equipments, *C*37.2." The work of revising this Standard now has been completed, and it has been submitted to the AIEE Standards committee for approval.

The committee has sponsored papers on supervisory control and telemetering equipment and is continuing its efforts to bring before the Institute papers which will be of value to the engineering profession.

During the January meeting, plans were formulated for a conference session on automatic or supervisory control of high-voltage air switches and on automatic control of large capacitor banks. There appears to be considerable interest in these subjects, but on account of the present curtailment of travel it does not appear feasible to arrange this conference at the present time.

The committee is represented on several joint subcommittees and is participating in their work. The joint subcommittee on power system application of carrier current is undertaking several projects which should provide valuable information in this field. A report of the work of the sectional committee (*C*67) on preferred voltages under 100 was presented at the winter meeting of the committee on automatic stations by its representative and was given careful consideration. The committee on automatic stations also has appointed full representation on the joint subcommittee on telemetering. This subcommittee is working under the sponsorship of the committee on instruments and measurements.

COMMITTEE ON DOMESTIC AND COMMERCIAL APPLICATIONS

The committee has been enlarged to a total of 21 members, and two more subcommittees have been formed in addition to the three that were formed last year. Those formed this year are the subcommittee on laboratory projects, and the subcommittee on load characteristics. The other three subcommittees are on electrical hazards to farm animals, farm applications, and wiring.

The work of the two new subcommittees has been devoted since their inception entirely to organization, as practically all of the members have been too involved in vital war work to devote much time to committee activity.

The committee on domestic and commercial applications was formed just prior to the war with the purpose of propagating, more fully than had previously been done, the activities judged to be within its scope by the AIEE. It has been most unfortunate that the extreme pressure of war activities on the part of most of its members has precluded more vigorous pursuit of the domestic and commercial problems that confronted the committee. Excellent ground work has been laid, and conclusion of hostilities in the European theater of operation again will free some of the membership for committee work. At the conclusion of the war the committee should be in an excellent position to advance fully and rapidly with the original intent and purpose.

COMMITTEE ON ELECTRIC MACHINERY

Meetings of the main committee were held in June 1944 and January 1945, and one meeting of the subcommittee chairmen was held in October. The chairman attended the meetings of standards and technical-program committees during the year.

The committee has sponsored many sessions of interesting papers on the several technical programs and has held several conference sessions. Particular interest was shown this year in the subjects of temperature measurements and standards. Also, much interest was shown in the subject of machine insulation, particularly in the new silicone materials.

The synchronous-machine test code, which was passed on to the Standards committee, now has been approved and is ready for publication.

The questions of temperature measurements by thermocouple and by resistance were discussed at length in conference papers. The data on a-c machines were summarized in two papers, and it is hoped that this material soon can be presented to the Standards committee.

Similar data on d-c machines are being collected by the d-c subcommittee, but it is believed that further tests by interchanging machines between manufacturers is necessary before any conclusions can be drawn.

Several new items have come up for consideration by the d-c subcommittee, the problem of testing for stray-load loss, and the proposal that a test code for brushes be worked out jointly with the committee on air transportation.

The transformer subcommittee held two meetings during the year, one in Cleveland, Ohio, on October 27, 1944, and one in New York on January 23, 1945. The complete revision of the ASA "Guide for Operation of Transformers and Regulators *C*57.3" was completed and now is awaiting publication. It will be presented to the ASA sectional committee at the proper time. A revision of the data in ASA Standards, *C*57.1 and *C*57.2 on impulse testing has been practically completed. Several changes in the above ASA Standards were agreed to and passed on to the ASA sectional committee.

The co-ordinated study of life of transformer insulation is continued. Temperature gradients, hot-spot temperatures, and insulation strength of dry-type transformers are receiving consideration. A working group is considering the accuracy requirements for voltage-regulator control devices as well as operation of regulators above rating. The thermal capability of regulators on a reclosing cycle also is being studied.

The subcommittee on industrial control has sponsored a number of papers and has made a start on the study of standards for control devices.

COMMITTEE ON ELECTRIC WELDING

Two meetings of the committee were held, one in Cleveland, October 18, 1944, and one in New York, January 23, 1945. The discussions dealt with standards, particularly those concerning ASA Standards *C*52 on resistance-welding and arc-welding machines and the sponsoring and preparation of papers for technical sessions. The committee has assigned two of its members to assist with the preparation of arc-welding standards under the arc-welding subcommittee of *C*52, and has offered similar assistance for the resistance-welding subcommittee, as soon as active work is started by this subcommittee.

Two technical sessions were sponsored by the committee, one in St. Louis in June 1944, at which three technical papers and one conference paper were presented, and one in New York in January 1945, at which three technical papers and one conference paper were presented. The technical program in New York in January was confined to arc-welding subjects, and it was planned to sponsor a resistance-welding program for the 1945 summer technical meeting in Detroit. With the cancellation of that meeting, some of the original papers planned still will be written and presented as part of the technical-paper program, with discussions by mail, and others will be postponed until a later date.

COMMITTEE ON ELECTROCHEMISTRY AND ELECTROMETALLURGY

Most of the work of the committee during the year was carried on by correspondence, small conference groups, and meetings of two very active subcommittees. Work of the committee has been limited during the war period. Details of new developments may be released later.

The subcommittee on voltage transients in arc-furnace circuits presented a paper on "Voltage Transients in Arc-Furnace Circuits" at the summer technical meeting in St. Louis. This was published as technical paper 44-99 and was read by the chairman of the subcommittee, J. E. Hobson. E. R. Whitehead became chairman in December 1944. At a meeting of the subcommittee held in Pittsburgh, Pa., on January 19, 1945, E. W. Boehne of the General Electric Company, gave a report and a very interesting discussion of his findings on overvoltages caused by circuit interruptions. F. J. Vogel of the Illinois Institute of Technology has been doing laboratory research on overvoltages in transformer secondary circuits, and he gave a report on the progress of this work. A survey of protective measures is in progress but was not advanced far enough at the time of the meeting to justify a report. An outline of desirable future action for the committee was drawn up.

The subcommittee on metallic rectifiers held two meetings, and reported considerable progress on a rectifier bibliography. It was expected that some time in April 1945 a preliminary draft would be collected, completed, and sent out to the membership. A list of proposed definitions for metallic rectifiers has been proposed. A full-day session w held with Army and Navy Air Corps a Signal Corps officers in discussing speci tests for rectifiers suitably protected for u in high humidity. Considerable progre has been made, and a series of co-operati tests at various plants are being undertake to establish standard methods of tests as we as means of finding approved methods protection. Some of the government pr curement specifications will be incorporate in the new standards when they are drafte

The committee is represented on the ne joint subcommittee on induction and d electric heating.

COMMITTEE ON ELECTRONICS

The committee has been active in solici ing and promoting papers on electronic su jects. Both the winter technical meeting an *Electrical Engineering* had a satisfactory pe centage of such papers.

This year at the winter technical meetin as an experiment, the available papers on th subject of electronics were distributed other committees whose sessions covered th subjects involved. This was done to increa the number of papers on electronics pr sented to the membership.

As an activity of the joint subcommitte on induction and dielectric heating, the com mittee on electronics took an active part organizing and conducting an informal tec nical conference on the subject of dielectri heating. This was well attended, whic indicated that such conferences form a us ful medium of promoting various aspects electronics among the members of the I stitute.

Two subcommittees of the committee hav been active during the year. A workin group of the subcommittee on electroni standards has had a number of meetings an is making excellent progress on the matte of nomenclature, and letter and graphic symbols. The object here has been to d fine electronic devices, particularly tho outside of the radio field.

The subcommittee on mercury-arc rect fiers has been renamed the power electroni subcommittee, and has been engaged active in the preparation of standards for mercur arc power converters. The standards wi cover definitions (rectifier names and lett symbols), standards (ratings and bases f acceptance tests), test code, operating guid and standards for rectifier transformer. Th subcommittee also has organized a workin group to prepare a report on "Inducti Co-ordination of Rectifier Equipment."

The scope of technical papers that can b obtained at the present time is restricted b cause of the war program, but it is believe that a sufficient number can be made ava able to keep this subject active and well repr sented at possible future technical meetin and in the pages of *Electrical Engineering* an the *Transactions*.

COMMITTEE ON INDUSTRIAL POWER APPLICATIONS

The main project of the committee w the completion of the report on "Electr Power Distribution for Industrial Plants" The report was presented at one of the tec nical sessions at the 1944 summer technic meeting in St. Louis, and was approved f publication by the board of directors. first issue of 10,000 copies was printed a released in January 1945. It already h

been sold out completely, and a second printing of 10,000 copies since has been approved. Plans are being developed for the translation of the report into Spanish and Portuguese by the International General Electric Company and Westinghouse Electric International Company for distribution by these companies in Central and South America.

This report is in the form of a manual of 100 printed pages, 8 by 11 inches in size, in flexible binding. It contains in condensed form the basic information needed by an electrical engineer or industrial architect to design an industrial power-distribution system. It is neither a code, nor a standard but is intended to promote the use of sound engineering principles in the design of such a system and the selection of equipment for it.

A subcommittee has been appointed to assemble and edit suggestions for revisions of the report, in preparation for a future second edition.

At the 1944 summer technical meeting, the committee sponsored, jointly with the committee on electronics and the committee on power transmission and distribution, a technical session for the presentation of five related papers on the use and design of electronic power converters. Another session was devoted to the presentation of two papers on the control and switching of shunt capacitors, a conference paper discussing electrical facilities of an important war plant, and a discussion of the afore-mentioned committee report.

An organization meeting was held of members of the newly created subcommittee on inductive and dielectric heating and members of the sponsoring committees, the committees on electronics, electrochemistry and electrometallurgy, and industrial power applications. J. J. Orr, chairman of this subcommittee, has surrounded himself with a highly representative group of men, all interested and active in the developments in high-frequency heating.

At the 1945 winter technical meeting in New York, the committee sponsored the presentation of eight technical papers in two technical sessions, and a conference session devoted to a discussion of industrial system and apparatus voltage ratings. Speakers represented the utilities, electric-machinery manufacturers, and the industrial power user. The conference was well attended and developed a great deal of interest.

Another conference session was sponsored by the subcommittee on inductive and dielectric heating. This session too was very well attended, confirming the great interest of electrical engineers in developments in this modern field. The very fine start made by the new subcommittee gives promise of fine practical achievements in coming years in a field which is so new that few, if any, standards have yet been developed.

A luncheon meeting of members of the main committee was used to lay plans for the coming year. The increasing importance of co-ordinated drives in industrial processes is recognized by the committee, and special efforts will be made to stimulate the presentation of papers dealing with such installations.

COMMITTEE ON INSTRUMENTS AND MEASUREMENTS

In spite of the restrictions of the war, which prevent the publication of many potential papers, the number of papers approved by the committee for the winter technical meeting was greater than could be accommodated on the program. Also, although handicapped by duties imposed by the war, the members of the committee have advanced many projects, particularly those in the fields of definitions and standards.

At the summer technical meeting two papers sponsored by the committee were presented, one on a method of measuring dielectric properties at ultrahigh frequencies and the other on high-frequency cable design and testing. At a session of the winter technical meeting, four papers in widely diverse fields were presented, one on a method of improving bushing current transformers by superposing third-harmonic frequency excitation on the core, one on a modulated high-frequency-system method of telemetering developed for the City of Seattle, Wash., one on the dynamic measurements of electromagnetic devices such as subrelays, and the fourth on a compact portable instrument for measuring insulation resistance in the field with direct current at high voltage. A fifth paper sponsored by the committee on an electronic interval timer for arc duration was presented at the session on industrial control.

The committee is finding that the employment of electronic circuits and devices for making measurements is increasing rapidly, and several of the new members appointed to the committee in the past year were selected because of their proficiency in the electronic field.

The subcommittees have been active, particularly in making several additions and changes in the definitions of electrical terms in preparation for some future revision of the present "American Standard Definitions of Electrical Terms" and in bringing into agreement the definitions relating to watt-hour meters in that volume, the "Meterman's Handbook," and the "Code for Electricity Meters." A former report on a proposed Standard 40 for recording instruments is being brought to the status of a standard, and a draft is being circulated for review among Institute members and others who have interest in such a standard. Considerable progress has been made in the preparation of the master test codes for both resistance and temperature measurements. The subcommittee on ultrahigh-frequency measurements has in preparation an article for *Electrical Engineering* on recent developments in measurements in the ultrahigh-frequency field. The subcommittee on dielectric measurements in the field has compiled a bibliography on the subject and now is preparing a report on the methods now available for such measurements together with their scope.

For some time past there has been no permanent committee or subcommittee in the Institute to which matters concerning instrument transformers could be readily referred. Hence, during the past year, the committee on instruments and measurements has established a permanent subcommittee on instrument transformers, on which are representatives of widely diversified interests. The formation of this subcommittee was facilitated by the close co-operation of the AIEE committee on protective devices and the ASA subcommittee on instrument transformers. In view of the rapid expansion of the field of industrial control the name and the scope of the subcommittee on that subject have been changed to subcommittee on electrical servomechanisms and follow-up devices. Also, if a new committee on industrial control devices is authorized by the Institute, the committee on instruments and measurements desires representation thereon, since a large number of industrial control devices depend on measuring devices to initiate their operation.

In accordance with a request from the National Roster of Scientific and Specialized Personnel of the War Manpower Commission, the committee has submitted to it a statement of the duties, skills, and functions of those engaged in the instrument and measurement field.

The committee also has been requested to co-operate with the Sections committee in the formation of technical groups on instruments and measurements in the different Sections, through the activity of committee members in their own Sections and by assisting in supplying speakers on subjects in the instrument and measurement field. The committee already has taken action through letters and other material sent to its members and by making available to Section chairmen the names of members of the committee in their Section. In the Boston Section such a technical group is already in active operation.

COMMITTEE ON LAND TRANSPORTATION

A joint meeting of the committee on land transportation and the oil and gas power group of the railroad division of the American Society of Mechanical Engineers was held on November 29, 1944, in New York. Papers were presented at this meeting on the subject of gas-turbine locomotives, covering developments in Switzerland and in the United States and the present status and prospects for future developments of the gas turbine as a propulsion unit for road locomotives. The meeting was very well attended, and interest in the subject was pronounced.

On the morning of January 25, 1945, during the winter technical meeting in New York, a meeting of the committee was held to discuss various subjects to be brought before the committee members. The technical papers already available were reviewed, and additional papers to be obtained on subjects of interest and value along lines covered by this committee were discussed. In the afternoon the committee sponsored a technical session at which the four papers presented were received with a great amount of interest, and extensive discussion resulted.

Three technical papers have been made available for use in the spring technical-paper program.

In the interest of keeping travel to a minimum under present transportation conditions, no additional committee meetings have been scheduled.

COMMITTEE ON PRODUCTION AND APPLICATION OF LIGHT

No technical sessions or conferences were sponsored by the committee during the year, and a conference tentatively planned for the summer meeting has been abandoned with the cancellation of this meeting.

A meeting of the committee was held at Institute headquarters on January 23, 1945, with a substantial number of the members in attendance.

The report of the subcommittee on pre-

ferred characteristics of electric power for lighting has been prepared, and, in accordance with recommendation made at the January committee meeting, will be referred to other interested technical committees for comments and suggestions.

COMMITTEE ON MARINE TRANSPORTATION

During the year, four new members were added to the committee. All of these new members are associated with prominent organizations, and their time is occupied completely with marine electrical matters. They are very helpful to the committee, and their enthusiasm has aided in a more critical review of the existing standard.

The committee had one all-day meeting, and four two-day meetings. The attendance at all the meetings has been excellent, despite the fact that all the members are overloaded with war work.

In accordance with the custom of the committee, the 93 pages of the 1940 edition of Standard 45 have been subdivided into eight sections and assigned to an equal number of subcommittees. These subcommittees have reviewed critically the 1940 edition and reported their findings to the committee. This has been a very laborious and time-consuming task, for the rapid development of marine electric installations during this quantity production of ships and increased uses of electric power, including electronic devices, has necessitated many revisions to keep abreast of the changing conditions. In addition these revisions have been necessitated by the greatly increased use of a-c distribution systems through the ship and the increased number of electrically propelled vessels.

COMMITTEE ON POWER GENERATION

The two major projects of the committee have been practically completed. The joint subcommittee with ASME has prepared a specification for steam-turbine governors, which has been issued on a trial basis. This work is being extended to other kinds of prime movers.

Another project in which the committee on power generation has participated actively was the preparation of standards for 3,600-rpm steam-turbine generators for sizes 10,000–60,000 kw. This work is virtually completed, and it is expected that the recommended specification will be issued on a trial basis this year.

The technical sessions sponsored by the committee during the summer technical meeting in St. Louis and the winter technical meeting in New York were devoted to diverse subjects of interest to the committee and general membership of the Institute.

A well-attended and quite successful technical conference was held at the last winter meeting on the subject of central-station auxiliaries.

The plans of the committee for the immediate future include a symposium on hydroelectric systems, a series of papers on excitation systems, in addition to further contributions on the subject of central-station auxiliaries.

COMMITTEE ON POWER TRANSMISSION AND DISTRIBUTION

A meeting of the subcommittee chairmen was held in October 1944, and a full meeting of the committee was held at the winter technical meeting in New York in January 1945.

Technical Meetings. At the summer meeting in St. Louis in June 1944, the committee sponsored two technical sessions. One session dealt with general transmission and distribution problems, and the other with cables. At the winter meeting in New York in January 1945, the committee sponsored three technical sessions, and one conference session. The technical sessions dealt with lightning and protective relaying, supervisory control and stability, and cables. The conference was on the subject of wartime practices on distribution systems, and consisted of four conference papers and discussion.

Subcommittee Activities. The distribution subcommittee and stations subcommittee devoted their principal activities to arrangements for the conference session, which was sponsored jointly by the two subcommittees.

The general systems subcommittee is planning a conference session on the factors involved in serving kilowatt and kilovar and the effect on the rate structure.

The transmission subcommittee through its working group on towers, poles, and conductors is sponsoring papers dealing with modern trends in wood-pole structure design. The working group on cables is arranging papers on cable temperatures and also is planning a review of duct heating constants. The working group on lightning and insulators is collecting material for an addition to the lightning reference book covering the period 1934 to 1944. Work also is proceeding on a report on predicting lightning performance of transmission lines. During the year, "AIEE Standard 41, Insulator Tests," sponsored by this group was published as "ASA Standard C29.1."

COMMITTEE ON PROTECTIVE DEVICES

One meeting of the executive committee was held in the fall, at which time all of the subcommittees were organized and the work outlined for the year. One meeting of the full committee was held in January to review progress reports by the subcommittees and to get suggestions from all members about the future program.

The committee sponsored ten technical papers at the 1944 summer meeting, four at the Pacific Coast meeting and 11 at the winter meeting. Plans are being made to continue the preparation of technical papers, particularly those having an important bearing on wartime developments or practices.

Activities of the subcommittees may be summarized as follows:

Circuit Breakers, Switches, and Fuses. Standard 25, covering fuses above 600 volts, was approved and sent to the Standards committee with the recommendation that it should be published as an approved standard.

Standard 20, covering low-voltage air circuit breakers, has been worked on diligently through the year. The wide interest and broad field of use of this apparatus has encouraged much discussion of the material in the proposed revision.

A draft of a Standard on "Reclosing Devices for Distribution Circuits" has been completed by the working group.

On Standard 22, "Air Switches," no active work is being done. A working group is collecting data and comments that may lead to suggesting revisions.

Standard 27, "Switchgear Assemblies," was reviewed by a working group, which reported that "the standards as issued in August 1942 do not require any action looking toward revision at this time."

There has been no activity looking toward a revision on Standard 19, "Power Circuit Breakers."

Items recommended for continuing by future committees are:

(*a*). Study of the calculating of short-circuit currents for low-voltage circuits.

(*b*). Revision of methods used for rating power circuit breakers.

(*c*). Derating factors for air circuit breakers on reclosing service.

Some engineers feel that air circuit breakers need not be derated as severely as oil circuit breakers when used on reclosing service.

Lightning-Protective Devices. The eighth draft of the proposed AIEE Standard for expulsion-type distribution arresters was sent to members of the subcommittee for final approval March 2, 1945.

Two of the projects, namely, industry performance characteristics of high-voltage protector tubes and rod-gap characteristics have been delayed until a suitable industry standard for impulse testing has been set up.

A survey was started in co-operation with the committee on electric machinery to determine the success of present methods used for lightning protection of rotating a-c machines, covering both protected and unprotected machines.

The performance data of expulsion-type distribution arresters are being secured from all manufacturers and will be published as a committee report giving the range of performance values available.

Fault-Current-Limiting Devices. The working group revising Standard 32 for "Neutral Grounding Devices" has been very active, but much still remains to be done.

The working group on "Present-Day Grounding Practices" is well organized to prepare a report of interest and value in connection with postwar conversions and new construction. Steps have been taken to enlist the aid and support of other technical committees interested.

Relays. This working group has prepared a bibliography for the preceding year and has distributed this to members of the relay subcommittee. This is a continuing program and is of considerable value in keeping all interested members up to date.

Generator Protection. This working group has been studying various phases of the subject and conducted a conference session at the winter technical meeting. It is expected the working group ultimately will prepare a report on recommended practices.

Current Transformers. A working group is preparing a report on the use of current transformers having a secondary current rating of less than five amperes which will indicate where these can be used to advantage and will include a discussion of application and limitations.

Protection of Powerhouse Auxiliaries. A working group is preparing a questionnaire

or limited circulation prior to issuing a report on present practices.

Transformer Protection. A working group was organized during the year to study various American and foreign practices and to prepare a report.

Instrument Transformer Standards for Relays. At the request of the ASA committee on transformers, a draft of a report has been completed recommending material for a proposed ASA section on instrument transformers.

National Electrical Code. A small working group has been working closely in cooperation with the committee on revision of the "National Electrical Code," and has made a number of recommendations, some of which have been adopted. This activity has been terminated.

Distribution Circuit Protection. A working group has just been organized to study the effect of distribution-circuit construction on the protection that can be obtained.

COMMITTEE ON APPLICATIONS OF ELECTRICITY TO THERAPEUTICS

The committee held no meetings during the year, as all of the members are engaged in war work. The members have, however, corresponded.

The war has resulted in the development of much new equipment which should prove valuable in the field of electrical therapy. Among the new developments are apparatus for determining the relaxation of muscles, for the production of very high-voltage cathode rays and for X rays at new wave lengths. Equipment is available for producing X rays at any voltage up to 100,000,000. This new equipment will be available for experimental therapy following the cessation of hostilities. There is evidence that the new rays may be of value in treating certain diseases.

It is the expectation of the committee that there will be a considerable and important development in the field of electrical therapeutics following the war.

Awards

COMMITTEE ON AWARD OF INSTITUTE PRIZES

Four Institute prizes and seven District prizes were awarded for papers presented during the calendar year 1943. As explained previously, the decrease in the number of District prize awards from that reported several years earlier is due to the effect of the training programs in the various colleges. No District prize for Branch paper was awarded during the academic year ending June 30, 1944.

A number of the technical papers were of a high order, and a choice between leading papers worthy of award was very close in several of the classifications. Two honorable mentions were made in the class of best paper prize and one honorable mention in the class of initial paper prize. The committee gratefully acknowledges the aid received from the technical committees and their reviewers in nominating and grading the large number of papers considered for the awards.

EDISON MEDAL

The Edison Medal, awarded by a committee composed of 24 members of the Institute, was presented for 1944 to E. F. W. Alexanderson, consulting engineer, General Electric Company, Schenectady "for his outstanding inventions and developments in the radio, transportation, marine, and power fields." The presentation took place January 24, 1945, during the winter technical meeting. The medal may be awarded annually for "meritorious achievement in electrical science, electrical engineering, or the electrical arts."

LAMME MEDAL

The Lamme Medal committee awarded the medal for 1944 to S. H. Mortensen, chief electrical engineer, Allis-Chalmers Manufacturing Company, Milwaukee, Wis., "for his pioneer work in the development of self-starting synchronous motors and for his contributions to the development of large hydraulic and steam-turbine-driven generators." Arrangements are being made for the presentation of the medal at the annual business meeting in New York, June 27, 1945. The medal may be awarded annually to a member of the AIEE "who has shown meritorious achievement in the development of electric apparatus or machinery."

JOHN FRITZ MEDAL

The John Fritz Medal board of award, composed of representatives of the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, ASME, and AIEE, awarded the 40th medal, for 1944, to John L. Savage, consulting engineer, for his "superlative public service in conceiving and administering the engineering of mammoth dams, both in America and beyond the seven seas."

HOOVER MEDAL

The Hoover Medal was established through a trust fund created by a gift from Conrad N. Lauer and is to be awarded periodically "to a fellow engineer for distinguished public service" by a board representing the ASCE, AIME, ASME, and AIEE. The seventh medal, for 1944, was awarded to Ralph E. Flanders, president, Jones and Lamson Machine Company, Springfield, Vt.

ALFRED NOBLE PRIZE

This prize, established in 1929, consists of a certificate and a cash award from the income of a fund contributed by engineers and others to perpetuate the name and achievements of Alfred Noble, past president of the ASCE, and of the Western Society of Engineers. It may be made to a member of any of the co-operating societies, ASCE, AIME, ASME, AIEE, or WSE, for a technical paper of particular merit accepted by the publication committee of any of these societies, provided the author, at the time of such acceptance, is not over 30 years of age. The award for 1944 was presented to W. R. Wilson, General Electric Company, Pittsfield, Mass., for his paper "Corona in Aircraft Electric Systems as a Function of Altitude."

CHARLES LE GEYT FORTESCUE FELLOWSHIP COMMITTEE

A fellowship amounting to $400 was awarded to Morton M. Astrahan, a student of Northwestern University and a veteran of the present war. Mr. Astrahan will undertake graduate work in the field of electronics at the California Institute of Technology starting in the fall of this year. The award is to cover expenses for the second semester as Mr. Astrahan will receive aid from the Veterans' Administration for the first semester.

Joint Activities

UNITED ENGINEERING TRUSTEES, INC.

This organization manages property and funds held jointly by the four founder societies, including the Engineering Societies Building, the Engineering Societies Library, and the endowment funds of the Engineering Foundation.

The building is fully occupied by engineering organizations, and additional space is needed both for offices and for meetings. Therefore, there has been a renewal of planning for the future adequate housing for engineering societies, and various types of projects are under serious consideration.

Increased revenue from meeting halls and the reduction of interest paid to the societies to token payments produced a small credit balance for the year ended September 30, 1944.

An abstract of the annual report for the year ended September 30, 1944, appeared in *Electrical Engineering* for February 1945, page 82.

ENGINEERING FOUNDATION

The Engineering Foundation was established in 1914 as a joint organization of the four societies, ASCE, AIME, ASME, and AIEE, for "the furtherance of research in science and engineering, and the advancement in any other manner of the profession of engineering and the good of mankind."

Each research project supported by it is under the sponsorship of one of the founder societies.

During the year 1944–45, work on five projects has been continued, and three new projects were initiated. The small number of each reflects the lessened demand for Foundation support caused by extensive government support of all types of research of probable importance to the war effort and the withdrawal of research personnel from the educational institutions to serve in war activities.

The Welding Research Council sponsored jointly by the AIEE and the American Welding Society has been in operation eight years. Its work is carried on by eight research committees. The principal accomplishment during the year 1943–44 was the development of a better understanding of the fundamentals of weldability and weld stresses.

An abstract of the annual report for the year ended September 30, 1944, appeared in *Electrical Engineering* for February 1945 pages 82–4.

ENGINEERING SOCIETIES LIBRARY

The Engineering Societies Library was formed by combining the separate libraries of the ASCE, AIME, ASME, AIEE, and preparing a composite card catalogue.

Special services rendered by the library include: photoprints, searches, abstracts, translations, bibliographies, book loans by mail.

Wartime conditions have prevented the usual growth in the book collection and

greatly increased the demand for photostat prints and for other services.

An abstract of the annual report for the year ended September 30, 1944, appeared in *Electrical Engineering* (Feb '45, p 84–5).

EMPLOYMENT SERVICE

Operating as an incorporated nonprofit organization, the Engineering Societies Personnel Service, Inc., assists members of the Founder Societies desiring to secure new positions and employers searching for engineers. Nonmembers may receive such assistance when positions available cannot be filled by members.

Offices are operated in New York; Boston, Mass.; Detroit, Mich.; Chicago; and San Francisco, Calif.; with the co-operation of the Engineering Societies of New England in Boston, the Engineering Society of Detroit in that city, the Western Society of Engineers in Chicago, and the Engineers Club of San Francisco in that city.

For several years, the service has been on a self-supporting basis, but the prevailing scarcity of engineers available for new positions has reduced the number of placements. A record of registration and placements during the past year is given in Table X.

Table X. Analysis of Employment Service

Month	Men Registered						Men Placed					
	New York	Chicago	San Francisco	Detroit	Boston	Total	New York	Chicago	San Francisco	Detroit	Boston	Total
1941												
May	88	17	64	21	18	208	23	9	25	7	8	72
June	95	25	73	24	11	228	31	12	18	5	7	73
July	69	26	54	17	14	180	21	8	18	4	6	57
August	95	29	69	23	13	229	20	9	24	4	6	63
September	89	30	59	22	10	210	25	6	27	9	4	71
October	73	30	65	19	11	198	30	3	16	9	6	64
November	77	24	65	23	17	206	25	13	23	11	3	75
December	75	14	55	16	5	165	18	5	18	4	7	52
1945												
January	71	12	65	10	2	69	21	6	15	4	3	49
February	61	28	35	11	10	145	21	14	15	5	3	58
March	76	27	49	25	9	186	26	6	20	9	2	63
April	84	23	47	20	8	182	22	11	18	6	4	61
Total	953	285	696	231	128	2206	283	102	237	77	59	758

ENGINEERS' COUNCIL FOR PROFESSIONAL DEVELOPMENT

This council, organized in 1932 to engage in activities leading toward the enhancement of the professional status of the engineer, includes three representatives of each of the eight participating organizations, which are the ASCE, AIEE, ASME, and AIME, the SPEE, the National Council of State Boards of Engineering Examiners, and the Engineering Institute of Canada. Its principal activities have been carried on by four committees: student selection and guidance, engineering schools, professional training, and professional recognition.

One of the principal accomplishments during the year which ended on September 30, 1944, was the development of a plan for accrediting technical Institutes. This will be administered by a subcommittee of the committee on engineering schools which has administered the accrediting of engineering college curricula.

A revised general reading list for junior engineers was approved, progress was made in the preparation of a manual for junior engineers, and continuing progress was reported in the measurement and guidance program.

Although, due to wartime programs, few inspections of engineering curriculums have been made, plans are being made for the reappraisal of all curriculums after the war.

A comprehensive report on the activities during the year ended September 30, 1944, was published in *Electrical Engineering* for December 1944, pages 452–4.

JOINT CONFERENCE COMMITTEE

This committee, composed of the presidents, immediate past presidents, and secretaries of the Founder Societies and the American Institute of Chemical Engineers, considered topics of interest to the societies.

The committee serves in an advisory capacity, making occasional recommendations to the societies on matters of interest to all.

RADIO TECHNICAL PLANNING BOARD

This joint advisory body, organized in 1943, will formulate recommendations on the technical future of radio developments for submission to the Government, industry, and the public.

Initial member bodies in addition to the AIEE are: Radio Manufacturers Association; Institute of Radio Engineers; American Institute of Physics; American Radio Relay League; F M Broadcasters, Inc.; International Association of Chiefs of Police; National Association of Broadcasters; and National Independent Broadcasters. The board includes one representative of each member organization.

The work is carried on mainly by 13 technical panels, which have prepared many comprehensive reports.

REPRESENTATIVES

A complete list of the more than 30 joint activities in which the Institute is represented appears in the Year Book and in the September issue of *Electrical Engineering* each year.

Appreciation

With grateful recognition of the extent and effectiveness of the activities and the large increase in membership during the past year, the board of directors expresses its deep appreciation and thanks to the national committees, and the District, Section, and Branch officers for their generous contributions of energy and time, despite the adverse conditions, and to the members in general for their continuing interest and participation in Institute affairs.

Respectfully submitted for the board of directors.

H. H. HENLINE
National Secretary

May 29, 1945

HASKINS & SELLS
CERTIFIED PUBLIC ACCOUNTANTS

1 EAST 44TH STREET
NEW YORK

May 18, 1945

American Institute of Electrical Engineers,
33 West 39th Street, New York.

Dear Sirs:

We have examined the balance sheet of the American Institute of Electrical Engineers, and schedule of securities owned, as of April 30, 1945, and the related statements of cash receipts and disbursements of operating and restricted funds for the year ended that date, have reviewed the accounting procedures of the Institute, and have examined its accounting records and other evidence in support of such financial statements. Our examination was made in accordance with generally accepted auditing standards applicable in the circumstances and included all auditing procedures we considered necessary, which procedures were applied by tests to the extent we deemed appropriate in view of the system of internal control.

In our opinion, the accompanying balance sheet, schedule of securities owned, and statements of cash receipts and disbursements fairly present, respectively, the financial condition of, and securities owned by, the Institute as of April 30, 1945, and its recorded cash receipts and cash disbursements for the year ended that date, in conformity with generally accepted accounting principles and practices applied on a basis consistent with that of the preceding year.

Yours truly,

(Signed) HASKINS & SELLS

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

(Incorporated in New York)

Balance Sheet, April 30, 1945

Exhibit A

ASSETS			LIABILITIES		
Property Fund Assets:			Property Fund Reserve		$ 549,824.60
One-fourth interest in physical properties of United Engineering Trustees, Inc.:			**Restricted Fund Reserves:**		
Land, buildings, and equipment (less depreciation and renewal reserve)	$369,974.15		Reserve Capital fund	$371,392.58	
Funded depreciation and renewal reserve	128,474.33		Life Membership fund	8,427.63	
Total	$498,448.48		Member for Life fund	3,268.71	
Equipment:			International Electrical Congress of St. Louis Library fund	5,748.05	
Library—volumes and fixtures—estimated value	36,366.37		Lamme Medal fund	4,456.66	
Office furniture and fixtures (less reserve for depreciation, $26,047.47)	11,395.49		Mailloux fund	1,120.08	
Works of art, etc.	3,001.35		Total restricted fund reserves		394,414.59
Cash—proceeds from redemption of mortgage certificate	612.01		**Operating Fund Reserves, Liabilities, Etc.:**		
Total property fund assets		$ 549,824.60	Accounts payable	$ 22,485.83	
Restricted Fund Assets:			Deferred income:		
Securities—at cost, less reserve, $7,372.65 (quoted market value, $398,266.61)—Schedule 1	$359,259.96		Dues received in advance	3,200.10	
Cash (Exhibit C)	35,064.88		Entrance fees and dues advanced by applicants for memberships	1,136.68	
Accrued interest receivable	89.75		Subscriptions to publications received in advance	13,771.06	
Total restricted fund assets		394,414.59	Miscellaneous (including unallocated receipts)	967.25	
Operating Fund Assets:			Operating fund reserves	77,874.10	
Cash (not including $1,295.18 for Federal taxes withheld from employees) (Exhibit B)	$ 77,206.09		Total operating fund reserves, liabilities, etc.		119,435.02
Accounts receivable:					
Members—for dues (less reserve, $5,700.00)	6,114.11				
Advertisers	6,729.00				
Miscellaneous	3,544.12				
Accrued interest receivable	4,309.52				
Inventories:					
Transactions, etc.	1,048.50				
Electrical Definitions	4,388.40				
Work in process (May issue of *Electrical Engineering*, etc.)	7,706.26				
Text and cover paper	6,799.68				
Badges	1,589.34				
Total operating fund assets		119,435.02			
Total		$1,063,674.21	Total		$1,063,674.21

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Statement of Cash Receipts and Disbursements of Operating Fund for the Year Ended April 30, 1945

Exhibit B

Cash on Deposit With The National City Bank of New York, May 1, 1944 (not including $1,079.42 for Federal taxes withheld from employees)		$ 53,749.13
Receipts:		
Dues (including $113,688.00 allocated to *Electrical Engineering* subscriptions)	$247,017.36	
Advertising	108,173.90	
Transactions subscriptions	7,832.37	
Electrical Engineering subscriptions	19,825.13	
"Electrical Definitions"	935.25	
"Electric Power Distribution for Industrial Plants"	7,803.80	
Miscellaneous publications (preprints, Standards, *Electrical Engineering* supplement, etc.)	25,299.78	
Students' fees	10,848.85	
Entrance fees	17,159.03	
Membership badges	4,088.06	
Transfer fees	2,908.00	
Interest and dividends on investments of Restricted Capital fund	10,037.77	
Miscellaneous	178.63	
Total receipts		462,107.93
Total		$515,857.06
Disbursements:		
Publication expense:		
Electrical Engineering	$112,263.90	
Transactions	10,154.47	
Year Book	4,682.86	
Miscellaneous publications (preprints, Standards, "Industrial Plants" report, *Electrical Engineering* supplement, etc.)	27,156.68	
Institute meetings	16,159.00	
Institute Sections	48,358.49	
Institute Branches	2,748.23	
Finance committee	629.29	
Headquarters committee	184.09	
Membership committee	9,059.91	
Standards committee	11,365.60	
Forward	$242,762.52	$515,857.06
Total (forward)	$242,762.52	$515,857.06
Technical committees	838.20	
Retirement system AIEE—normal contribution (see Exhibit C for payment of $25,000.00, special contribution from Reserve Capital fund)	5,074.35	
Radio Technical Planning Board	1,000.00	
Traveling expenses:		
Geographical Districts:		
Executive committees	4,731.57	
Vice-presidents	793.92	
Branch counselors and chairmen	2,045.97	
President's appropriation	1,245.09	
AIEE representatives	176.92	
Board of directors	5,655.16	
National nominating committee	1,138.68	
Administrative expenses	58,302.06	
Geographical Districts—Branch paper prizes	353.29	
Institute prizes, national	409.00	
American Co-ordinating Committee on Corrosion	25.00	
American Standards Association	1,500.00	
United Engineering Trustees, Inc.:		
Building assessment	17,813.56	
Library assessment	11,006.20	
Engineers' Council for Professional Development	1,700.00	
Engineering Foundation Project—welding research	250.00	
National Committee State Board Engineering Examiners	350.00	
International Committee on Illumination	30.00	
John Fritz Medal	50.00	
National Fire Protection Association—Dues	60.00	
Membership badges	4,585.47	
Legal services	250.00	
Committee on collective bargaining and related matters	691.40	
Office furniture and fixtures, and repairs	5,313.33	
Edison Medal committee	230.57	
Transfers:		
To Reserve Capital fund	67,000.00	
To Member for Life fund	3,268.71	
Total disbursements		438,650.97
Cash on Deposit With The National City Bank of New York, April 30, 1945 (not including $1,295.18 for Federal taxes withheld from employees)		$ 77,206.09

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Statement of Cash Receipts and Disbursements of Restricted Funds for the Year Ended April 30, 1945

Exhibit C

	Restricted Funds						
	Reserve Capital Fund	Member for Life Fund	Life Membership Fund	International Electrical Congress of St. Louis Library Fund	Lamme Medal Fund	Mailloux Fund	Total Restricted Funds
Cash on Deposit With The National City Bank of New York and Various Savings Banks, May 1, 1944	$ 27,676.29		$2,827.14	$401.80		$1,104.34	$ 32,009.57
Receipts:							
Interest on bonds			$ 125.00	$130.00	$ 240.00		$ 495.00
Interest on bank balances			43.56			$ 16.62	60.18
Proceeds from sale of securities	$ 8,535.00				4,200.00		12,735.00
Transfer from operating fund	67,000.00	$3,268.71					70,268.71
Life membership fees			845.66				845.66
Total receipts	$ 75,535.00	$3,268.71	$1,014.22	$130.00	$4,440.00	$ 16.62	$ 84,404.55
Total	$103,211.29	$3,268.71	$3,841.36	$531.80	$4,440.00	$1,120.96	$116,414.12
Disbursements:							
Purchase of securities	$ 51,624.89				$4,253.78		$ 55,878.67
Retirement system AIEE—contribution to meet the requirements of an increase in the allowance for prior services of the headquarters staff	25,000.00						25,000.00
Transfer to operating fund			$ 460.57				460.57
Engrossing certificate					10.00		10.00
Total disbursements	$ 76,624.89		$ 460.57		$4,263.78		$ 81,349.24
Balance on Deposit With The National City Bank of New York and Various Savings Banks, April 30, 1945	$ 26,586.40	$3,268.71	$3,380.79	$531.80	$ 176.22	$1,120.96	$ 35,064.88

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Securities Owned, April 30, 1945

Schedule 1

	Principal Amount of Bonds or Number of Shares of Stock	Restricted Funds				
		Reserve Capital Fund	Life Membership Fund	International Electrical Congress Library Fund	Lamme Medal Fund	Total Restricted Funds
Railroad Bonds:						
Atlantic Coast Line, First Consolidated 4%, due 1952	$ 4,000.00				$4,253.78	$ 4,253.78
Baltimore & Ohio, Pittsburgh, Lake Erie & West Virginia System 4%, due 1951	10,000.00	$ 6,450.00				6,450.00
Chicago & Erie Railroad Company 5% first mortgage, due 1982. Registered	1,000.00	1,105.00				1,105.00
New York Central Railroad Company 4% series A consolidated mortgage, due 1998	10,000.00	6,100.00				6,100.00
St. Louis-San Francisco Railway Company 5% prior lien mortgage series B, due 1950 (certificates of deposit). Registered, Stamped	6,000.00*	5,497.50*				5,497.50*
Total railroad bonds		$ 19,152.50			$4,253.78	$ 23,406.28
Public Utility Bonds:						
New York & Queens Electric Light & Power Company 3½% first and consolidated mortgage, due 1965	10,000.00	$ 11,000.00				$ 11,000.00
United States Government Bonds:						
Treasury Savings bonds series D, due July 1, 1949	10,000.00	$ 7,644.00				$ 7,644.00
Treasury Savings bonds series D, due January 1, 1950	10,000.00	7,500.00				7,500.00
Treasury bonds 2%, due 1950/48	77,000.00	78,130.94				78,130.94
Treasury bonds 2%, due 1950, Registered	3,000.00	3,060.94				3,060.94
Treasury bonds 2½%, due 1968/63	20,000.00	15,000.00	$5,000.00			20,000.00
Treasury bonds 2½%, due 1972/67	6,300.00	1,100.00		$5,200.00		6,300.00
Treasury bonds, 2½%, due 1972, Registered	3,500.00	3,516.41				3,516.41
Defense bonds series F, due June 1, 1953	34,000.00	25,160.00				25,160.00
Defense bonds series G, 2½%, due December 1, 1954	18,000.00	18,000.00				18,000.00
War Savings Bonds series G, 2½%, due September 1, 1955	40,000.00	40,000.00				40,000.00
War Savings Bonds series G, 2½%, due 1956	17,000.00	17,000.00				17,000.00
Total United States Government bonds		$216,112.29	$5,000.00	$5,200.00		$226,312.29
Capital Stocks:						
American Can Company	60 shares	$ 4,988.40				$ 4,988.40
American Telephone & Telegraph Company	50 shares	8,183.65				8,183.65
Atchison, Topeka & Santa Fe Ry. Company—Preferred	150 shares	13,035.46				13,035.46
Boston Edison Company	200 shares	4,927.50				4,927.50
Commonwealth Edison Company	200 shares	7,580.68				7,580.68
Consolidated Natural Gas Company	11 shares	221.92				221.92
Eastman Kodak Company	35 shares	4,768.23				4,768.23
E. I. du Pont de Nemours & Company	50 shares	7,982.07				7,982.07
General Electric Company	130 shares	4,463.80				4,463.80
General Motors Corporation	100 shares	4,235.53				4,235.53
International Harvester Company	100 shares	5,030.50				5,030.50
International Match Realization Co., Ltd. voting trust certificates for capital shares of International Match Corporation	6 shares*	1,875.15*				1,875.15*
Ohio Edison Co. 4.40% preferred stock	150 shares	15,727.50				15,727.50
Sears Roebuck & Company	100 shares	6,014.97				6,014.97
Standard Oil Company of New Jersey	200 shares	9,601.26				9,601.26
Union Carbide & Carbon Corporation	100 shares	7,277.42				7,277.42
Total capital stocks		$105,914.04				$105,914.04
Total		$352,178.83	$5,000.00	$5,200.00	$4,253.78	$366,632.61
*Less reserve in full for securities considered to be of doubtful value		7,372.65				7,372.65
Total Securities, Less Reserve		$344,806.18	$5,000.00	$5,200.00	$4,253.78	$359,259.96

Contents of June 1945 Supplement Announced

The five remaining technical papers presented at the 1945 AIEE winter technical meeting and not published in the monthly Transactions sections of *Electrical Engineering*, January to June inclusive, will appear in the June 1945 "Supplement to Electrical Engineering—Transactions Section" soon to be released. The discussions submitted on these papers and on the technical papers published in the January–June monthly sections also will be included in the supplement, completing the publication of papers and discussion presented at the New York winter meeting. All papers and discussions ultimately will be included in the 1945 *Transactions* volume.

Copies of the supplement will be mailed shortly to those who entered advance orders. Others may obtain copies at 50 cents each from the AIEE order department, 33 West 39th Street, New York 18, N. Y., as long as the limited supply lasts.

The following papers which have been abstracted in *Electrical Engineering* will be printed in the supplement:

45-22—Damping and Synchronizing Torques of Power Selsyns; *C. Concordia* (*M '37*), *Gabriel Kron* (*A '30*). Abstracted in the January 1945 issue, page 33.

45-25—The Design of Bus-Bar Industrial Distribution Systems: an Epitomization of Available Data; *T. J. Higgins* (*A '40*). Abstracted in the January 1945 issue, page 35.

45-43—Field Tests and Performance on Heavy-Duty High-Speed 138-Kv Circuit Breakers—Oil and Air-Blast; *Philip Sporn* (*F '30*), *H. P. St. Clair* (*F '44*). Abstracted in the January 1945 issue, page 38.

45-67—Impedances Seen by Relays During Power Swings With and Without Faults; *Edith Clarke* (*M '33*). Abstracted in the January 1945 issue, page 37.

45-69—The Resistance-Coupled Amplifier; *L. G. Cowles* (*A '37*). Abstracted in the January 1945 issue, page 32.

1945 Year Book Issued

The 1945 edition of the AIEE Year Book has been issued, in accordance with 1944–45 budget provisions. Addresses are corrected as of November 1, 1944. Copies have been distributed to all national, District, and Section officers, Student Branch counselors, and all members of national committees. Other members desiring copies may obtain them by writing to the AIEE order depart-

ment, 33 West 39th Street, New York 18, N. Y. The Year Book is not available to nonmembers of the Institute, nor is its use permitted for commercial, promotional, or other circularization purposes.

National and District Prize Awards for 1944 Announced

Announcement of the 1944 recipients of national prizes for papers was made by F. A. Cowan, chairman of the committee on award of Institute prizes at the annual meeting held in the Engineering Societies' Building, New York, N. Y., on June 27. Personal presentations were made to those who attended. Each national prize award consists of an appropriately engrossed certificate and a check for $100 divided in the case of coauthors. As there was only one eligible paper in the field of public relations and education, no award was made in this class. Also owing to the wartime situation no papers were submitted for the national prize for Branch paper

The awards were as follows:

Best Paper in Engineering Practice: Prize awarded to P. Halpert (A '37) and O. E. Esval (A '37) of the Sperry Gyroscope Company, Inc., Garden City, N. Y., for their paper, "Electric Automatic Pilots for Aircraft," presented at the 1944 Los Angeles technical meeting, August 29–September 1, and published in the 1944 *Transactions*, pages 861–6. Honorable mention was awarded to H. Winograd (M '39) of the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., for his paper, "Development of Excitron-Type Rectifier," presented at the 1944 North Eastern District technical meeting, April 19–20, and the 1944 summer technical meeting, June 26–30, and published in the 1944 *Transactions*, pages 969–78.

Best Paper in Theory and Research: Prize awarded to E. W. Boehne (F '43) of the General Electric Company, Philadelphia, Pa., for his paper, "The Geometry of Arc Interruption—II. Current-Zero Phenomena," presented at the 1944 winter technical meeting, January 24–28, and published in the 1944 *Transactions*, pages 375–87. Honorable mention was awarded to L. J. Berberich (M '36), G. L. Moses (M '44), A. M. Stiles (A '43), and C. G. Veinott (M '34) of the Westinghouse Electric Corporation, East Pittsburgh, Pa., for their paper, "Effect of Altitude on Electric Breakdown and Flashover of Aircraft Insulation," presented at the 1944 winter technical meeting, January 24–28, and published in the 1944 *Transactions*, pages 345–54.

Initial Paper: Prize awarded to L. G. Abraham (M '39), A. J. Busch (M '30), and F. F. Shipley (M '43) of the Bell Telephone Laboratories, Inc., New York, N. Y., for their paper, "Crossbar Toll Switching System," presented at the 1944 winter technical meeting, January 24–28, and published in the 1944 *Transactions*, pages 302–09. Honorable mention was awarded to F. J. Maginniss (A '43) and N. R. Schultz (A '40) for their paper, "Transient Performance of Induction Motors," presented at the 1944 summer technical meeting, June 26–30, and published in the 1944 *Transactions*, pages 641–6.

DISTRICT PRIZES

District prizes for AIEE papers have been announced by four Districts. The awards are for papers presented during 1944. Each District prize consists of an appropriately engrossed certificate and check for $25, divided in the case of coauthors.

District 2

Prize for best paper was awarded to D. Ramadanoff (M '37) and S. W. Glass for their paper, "High-Altitude Brush Problem," presented at a meeting of the Cleveland Section, December 5, 1944.

Prize for initial paper was awarded to W. G. Hall (A '38) for his paper, "Effect of Rotor Skew on Squirrel-Cage-Motor Speed-Torque Characteristics," presented at a meeting of the Cleveland Section, December 5, 1944.

District 6

Prize for best paper was awarded to T. S. Oliver (M '43), N. R. Love (M '38), S. W. Atkins, and H. Sharp (M '31) for their paper, "The Effect of Large Rectifiers on Power-System Wave Shape and Telephone-Circuit Noise," presented at a meeting of the Denver Section, February 18, 1944.

District 9

Prize for best paper was awarded to B. V. Hoard (M '36) and G. W. Bills (A '38) for their paper, "An Analysis to Determine the Optimum Bussing Arrangements and Transmission Capabilities at Grand Coulee," presented at the 1944 Los Angeles technical meeting, August 29–September 1.

District 10

Prize for best paper was awarded to C. K. Duff (M '41) for his paper, "Load, Frequency, and Time Control of Interconnected Systems," presented at a meeting of the Toronto Section, October 26, 1944.

Prize for initial paper was awarded to J. T. Madill (A '41) for his paper "Field Decay Characteristics of Large Hydroelectric Generators," presented at a meeting of the Montreal Section, October 26, 1944.

Officers for 1945-46 Announced at Annual Meeting

Institute officers for the year beginning August 1, 1945, were announced in the report made by the committee of tellers to the annual meeting of the AIEE held in New York, N. Y., June 27. The new officers are:

President: William E. Wickenden, president, Case School of Applied Science, Cleveland, Ohio.

Vice-Presidents: E. S. Fields, vice-president, Cincinnati (Ohio) Gas and Electric Company (District 2, Middle Eastern); H. B. Wolf, superintendent of maintenance, Duke Power Company, Charlotte, N. C. (District 4, Southern); L. M. Robertson, transmission and station engineer, Public Service Company of Colorado, Denver (District 7, South West); F. F. Evenson, consulting engineer, San Diego, Calif. (District 8, Pacific); F. L. Lawton, assistant chief engineer, general engineering department, Aluminum Company of Canada, Ltd., Montreal, Quebec (District 10, Canada).

Directors: J. M. Flanigen, plant engineer, Georgia Power Company, Atlanta; J. R. North, assistant chief electrical engineer, Commonwealth and Southern Corporation, Jackson, Mich.; Walter C. Smith, Pacific district engineer, General Electric Company, San Francisco, Calif.

Treasurer: W. I. Slichter, professor emeritus of electrical engineering, Columbia University, New York, N. Y.

The board of directors for the administrative year beginning August 1, 1945, will consist of the foregoing elected officers and the following holdover officers:

Charles A. Powel, East Pittsburgh, Pa. (*retiring president*); Nevin E. Funk, Philadelphia, Pa. (*junior past president*); C. B. Carpenter, Portland, Oreg.; M. S. Coover, Ames, Iowa; J. F. Fairman, New York, N. Y.; R. T. Henry, Buffalo, N. Y.; R. W. Warner, Austin, Tex. (*vice-presidents*); P. L. Alger, Schenectady, N. Y.; K. L. Hansen, Milwaukee, Wis.; C. M. Laffoon, East Pittsburgh, Pa.; M. J. McHenry, Toronto, Ontario, Canada; C. W. Mier, Dallas, Tex.; S. H. Mortensen, Milwaukee, Wis.; W. B. Morton, Philadelphia, Pa.; D. A. Quarles, New York, N. Y.; W. R. Smith, Newark, N. J. (*directors*).

Additions to List of Members for Life

Membership for life is granted by the AIEE to members who either have paid annual dues for 35 years, or have reached the age of 70 and paid dues for 30 years. A list of those who have become members for life during the preceding year is published annually in *Electrical Engineering*. Institute members who have attained this status since publication of the last list in the July 1944 issue are:

R. T. Anderson	J. L. Kruger
R. L. Baldwin	H. A. Laidlaw
C. P. Banzhof	R. C. Landes
F. W. Brown	O. L. LeFever
J. W. Brown	W. W. Lewis
J. T. Butterfield	G. J. Lipscomb
N. A. Carle	A. C. Lockwood
F. J. Chesterman	F. H. Mason
J. C. Clark	A. S. Moody
J. M. Coahran	W. C. Nein
W. H. Cole	A. J. Noerager
A. Colvin	J. K. Ostrander
P. H. Daggett	R. F. Pack
R. H. Dalgleish	W. K. Page
W. A. Danielson	W. D. A. Peaslee
E. D. Doyle	L. M. Perrin
J. F. Dunn	F. G. Perry
E. D. Eby	E. A. Plumer
G. E. Edgar	H. C. Powell
C. C. Egbert	B. Price
L. R. Elder	C. N. Rakestraw
F. P. Fahy	W. K. Rhodes
H. H. Febrey	L. H. Rittenhouse
A. D. Fishel	F. W. Rose
I. W. Fisk	A. M. Rossman
G. H. Fletcher	M. W. Sage
H. Flood, Jr.	F. Sawford
W. A. Forbush	G. B. Schneeberger
E. S. Foster	E. G. Scott
J. Franz	J. W. Sheffer
G. H. Garcelon	W. H. Soule
M. M. Goldberg	S. A. Staege
C. W. Green	W. G. Stearns
H. M. Grossman	A. C. Streamer
W. M. Hall	H. C. Sutton
F. Hannaford	G. B. Thomas
F. W. Harris	F. Thornton, Jr.
K. A. Hawley	W. H. Timbie
R. E. Hecker	O. C. Traver
W. L. Hoffman	F. P. Vaughan
S. B. Hood	O. O. Wagley
R. G. Hudson	H. W. Watt
A. Kennedy	J. West
E. E. Kilburn	J. F. Wiggert
C. C. Knipmeyer	W. J. Williams
B. F. Kohlhausen	C. A. Wolfrom

T. Yensen

SECTION

Philadelphia Section Features Fun at Final Meeting

The annual election of officials for the next season and four managers, each to serve two terms, and a demonstration of the Amplidyne, together with the presentation of a paper on the subject by John R. Williams of the General Electric Company, furnished the serious aspect of the final meeting of the AIEE Philadelphia Section held in May 1945, with an attendance of 275. The remainder of the evening was devoted to a program developed by the fellowship and attendance committee to promote good fellowship among the members and to reward those who had been faithful in attendance.

A feature of the entertainment program was the awarding of various gifts, with appropriate "pompous" ceremony, to individuals whose names were drawn by chance. There was a ticket in the drawing bearing the member's or guest's name for each technical meeting of the Philadelphia Section or Wilmington Subsection he had attended, but the receipt of one award disqualified the recipient from further participation in the contest. Recipients were required to prove their worthiness according to the whims of two gowned and bewigged judges.

During the evening's proceedings a resolu-

tion of thanks, appreciation, and good wishes, signed by all officers and committee chairmen in the Section, was tendered Andrew C. Muir (M '39) retiring chairman.

Panhandle Subsection Organized in Texas

The North Texas Section officially has established the Panhandle Subsection which was organized at Amarillo, Tex., on May 10, 1945, as a result of a petition signed by 14 members in the Panhandle. There were 26 members and interested visitors at the organization meeting at which the following officers were elected:

Chairman: J. G. Ausman (M '45) Southwestern Public Service Company, Amarillo.

Vice-chairman: C. V. Bullen (A '23) Texas Technological College, Lubbock, Tex.

Secretary-Treasurer: D. H. Hickey (A '43) Capitol Hotel, Amarillo.

Official recognition of the Panhandle Subsection was forthcoming when the North Texas Section adopted amendments to its bylaws which authorized the executive committee to establish Subsections and technical groups.

Maryland Section Meets. The May meeting of the Maryland Section of the AIEE this year was held jointly with that of the Maryland Section of the American Society of Mechanical Engineers and was devoted to papers and motion pictures describing the structural, electrical, and mechanical features of the new Riverside generating station of the Consolidated Gas Electric Light and Power Company of Baltimore, Md. At the meeting a booklet containing a foreword and the two papers presented was distributed by that company.

ABSTRACTS

Abstract of Final Summer Paper Received

The following abstract of a summer technical paper was not received in time for publication in the June issue of *Electrical Engineering*.

45-109—Automatic Temperature Control for Aircraft; *R. A. Gund (A '41). 15 cents.* The development of the modern high-speed aircraft has instigated a new application of automatic temperature control, that of controlling the position of cooling flaps. The problem becomes complicated because of the many variable conditions encountered in aircraft operation. Because cooling-flap control is a recent addition to the aircraft industry, there is a need to classify the various basic types of automatic temperature-control systems and to explain briefly their advantages and disadvantages as air-borne equipment. In addition to the aforementioned description a successful aircraft automatic temperature-control system is described.

PERSONAL

Charles Edward Skinner (A '99, M '03, F '12) senior electrical engineer, Fort Monmouth (N. J.) Signal Corps Laboratory, and retired assistant director of engineering, Westinghouse Electric Corporation, East Pittsburgh, Pa., was elected an Honorary Member of the Institute, May 29, 1945. Doctor Skinner, who was born May 30, 1865, in Redfield, Ohio, was graduated from Ohio State University with the degree of mechanical engineer in 1890 and holds the honorary degrees of doctor of science (1927) and doctor of engineering (1935) from that university. He commenced his 43-year association with the Westinghouse Company in 1890 as machinist in charge of the manufacture of railway controllers. In 1892 he took charge of inspection and testing of windings, in 1895 of insulation design and testing, and in 1905 of the insulation division. In 1906 he was made head of the research division and in 1920 of the research department. He was appointed assistant director of engineering in 1921, from which position he retired in 1933. Doctor Skinner was responsible for much of the organization and reorganization incidental to the company's growth. He wrote most of the early purchasing-department specifications, organized the insulation division, process engineering work, the research division, and organized and equipped the chemical, physical, and high-voltage laboratories. In 1915 he supervised the building, equipping, and manning of a new research laboratory. His contributions to AIEE affairs have been outstanding. He has held the national offices of president (1931–32), vice-president, and manager and has represented the Institute on the United States National Committee of the International Electrotechnical Commission, the American Engineering Council, the American Association for the Advancement of Science, the Division of Engineering and Industrial Research of the National Research Council, the Iwadare Foundation, the board of management of the World Congress of Engineers, the John Fritz Medal Board of Award, and the Charles Coffin Fellowship and Research Fund Committee. Among the many AIEE committees on which he has served are those on: the Edison Medal, education, electrophysics, Institute policy, research, Standards, and electric machinery. He has participated in many international gatherings of engineers, first going to Brussels in 1906 as American representative of the International Association for Testing Materials. Many times delegate to the International Electrotechnical Commission, he journeyed to Brussels in 1920, Geneva in 1922, The Hague in 1925, and Bellagio in 1927. He was a delegate to the World Power Conference in London in 1924 and the World Engineering Congress in Tokyo in 1929, and he was Iwadare Foundation lecturer in Japan in 1934. He is the author of various papers dealing with insulation, iron testing, and research, and was awarded the Lamme Medal of Ohio State University in 1931. He is a member of Tau Beta Pi, the American Physical Society, the American Society for Testing Materials, the American Society of Mechanical Engineers, the American Association for the Advancement of Science, the Franklin Institute, the American Electrochemical Society and the Engineering Society of Western Pennsylvania.

E. W. Boehne (A '29, F '43) co-ordinator, research and development, Philadelphia (Pa.) Works, General Electric Company, has been awarded the 1944 best paper prize in the field of theory and research for his paper, "The Geometry of Arc Interruption—II. Current-Zero Phenomena." He received the degrees of bachelor of science (1926) and electrical engineer (1940) from the Agricultural and Mechanical College of Texas, and that of master of science (1928) from the Massachusetts Institute of Technology. He was employed by the General Electric Company, Lynn, Mass., in 1926, transferring to Schenectady in 1928 where he made numerous contributions in the field of lightning and surge protection of rotating machines before joining the switchgear-engineering department in 1933. Following assignments on design and development projects, for which he was twice awarded the Charles A. Coffin Award, he was made co-ordinator of research and development. Mr. Boehne received honorable mention in the selection of the outstanding young engineer for 1936 by Eta Kappa Nu and in 1941 received the AIEE District 2 best paper prize for his paper, "The Geometry of Arc Interruption."

O. E. Esval (A '37) director, aircraft instrument research, Sperry Gyroscope Company, Garden City, N. Y., has been awarded the 1944 national prize for best paper in the field of engineering practice as coauthor of the paper, "Electric Automatic Pilots for Aircraft." A graduate of Iowa State College

C. E. Skinner

O. E. Esval

E. W. Boehne

in 1929 with the degree of bachelor of science in electrical engineering, Mr. Esval became associated with the General Electric Company, Schenectady, N. Y., in that same year in the student test course, subsequently accepting the position of engineer in the motor-engineering department. In 1931 he joined the engineering department of the Sperry Gyroscope Company to work in the fire-control department and the research laboratory. Mr. Esval is a member of the Institute of Aeronautical Sciences and the National Aeronautic Association. He is the author of several technical papers.

Percy Halpert (A '37) project engineer, Sperry Gyroscope Company, Inc., Garden City, N. Y., has been awarded the 1944 national best paper prize in the field of engineering practice as coauthor of the paper, "Electric Automatic Pilots for Aircraft." Mr. Halpert was graduated from the College of the City of New York with the degree of bachelor of science in engineering in 1935, and he received the degree of electrical engineer in 1936. Following graduation he accepted a position with Aerovox Corporation, Brooklyn, N. Y., as supervisor in charge of wet electrolytic capacitor anode formation. In 1937 he became test engineer for the Sperry Gyroscope Company, Inc., was appointed to the laboratory staff in 1938 for research and development in automatic controls, and was made research engineer in charge of flight-control research in 1942.

F. F. Shipley (M '43) technical staff member, Bell Telephone Laboratories, Inc., New York, N. Y., has been awarded the national 1944 best paper prize in the initial-paper field as coauthor of the paper, "Crossbar Toll Switching System." After graduating with a bachelor-of-science degree in electrical engineering in 1925 from Purdue University, Mr. Shipley became a member of the department of development and research of the American Telephone and Telegraph Company, New York. Here he worked on toll-switching problems and patent studies, and in 1934 accepted the position as a member of the technical staff of Bell Telephone Laboratories.

L. G. Abraham (M '39) communications engineer, Bell Telephone Laboratories, Inc., New York, N. Y., has been awarded the national 1944 best paper prize for initial paper as coauthor of the paper, "Crossbar Toll Switching System." Mr. Abraham received the degrees of bachelor of science in 1922 and master of science in 1923, both in electrical engineering, from the University of Illinois. In 1923 he joined the department of development and research of the American Telephone and Telegraph Company, New York, N. Y., as a member of the transmission development department and was transferred to the Bell Telephone Laboratories in 1934. His work has been chiefly in connection with toll circuits and has been particularly directed toward securing optimum over-all performance of telephone message connections.

A. J. Busch (A '24, M '30) member of the technical staff, Bell Telephone Laboratories, Inc., New York, N. Y., has been awarded the national 1944 best paper prize for initial paper as coauthor of the paper, "Crossbar Toll Switching System." Mr. Busch was graduated with the degree of electrical engineer in 1922 from the Polytechnic Institute of Brooklyn. He was first employed as development engineer in the engineering department of the Western Electric Company, New York, N. Y., until 1925 when he became a member of the technical staff of the Bell Telephone Laboratories. Since 1941 he has supervised a development group engaged in the design of automatic telephone switching systems and in charge of communications work for the Armed Forces.

C. G. Veinott (A '28, M '34) special development engineer, Westinghouse Electric Corporation, Lima, Ohio, has received honorable mention in the 1944 national best paper prize award in the field of theory and research, as coauthor of the paper, "Effect of Altitude on Electric Breakdown and Flashover of Aircraft Insulation." He was graduated in 1926 from the University of Vermont with a bachelor-of-science degree in electrical engineering and in that same year began a student graduate course with Westinghouse Electric Corporation, East Pittsburgh, Pa., where he subsequently did development work in the office of the chief electrical engineer and became instructor in the electrical department of the technical night school. In 1929 he was transferred to East Springfield, Mass., in the small-motor engineering department, in 1931 became electrical design engineer, and in 1937 was transferred again, this time to Lima, Ohio, to become design and application engineer. In 1936 Mr. Veinott received honorable mention in connection with the selection of America's outstanding young engineer for that year, by Eta Kappa Nu, and in 1938 he was awarded the degree of electrical engineer from the University of Vermont. He has served on the AIEE committee on electronics and is an active member of that on electric machinery. He is the author of several technical papers.

L. J. Berberich (A '30, M '36) section engineer, insulation department, research laboratories, Westinghouse Electric Corporation, East Pittsburgh, Pa., has received honorable mention in the 1944 national prize award in the field of theory and research, as coauthor of the paper, "Effect of Altitude on Electric Breakdown and Flashover of Aircraft Insulation." He was graduated from Johns Hopkins University, receiving the degrees of bachelor of engineering in 1928, and doctor of engineering in 1931. From 1927 to 1931 he was at various times employed as student engineer by the Westinghouse Electric Corporation, as junior engineer by the National Bureau of Standards, Washington, D. C., and as research assistant by Johns Hopkins University, Baltimore, Md. In 1931 he became associated with the research and development division of the Socony-Vacuum Oil Company, Inc., Paulsboro, N. J., as research engineer, in 1941 became group leader, and in 1943 was made section engineer in charge of the physical and electrical section. Doctor Berberich is the author of several technical papers and the holder of a number of patents. He has served as a member of the AIEE committee on research and is now a member of the subcommittee on insulation resistance of the AIEE committee on electric machinery.

Harold Winograd (A '26, M '39) engineer in charge, rectifier design, electrical department, Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has received honorable mention in the 1944 national prize awards, in the field of engineering practice for his paper, "Development of Excitron-Type Rectifier." Born September 12, 1900, in Russia, Mr. Winograd was graduated from Cornell University in 1924 with the degree of electrical engineer. In 1925 after a year and a half in the test department of the United Electric Light and Power Company, New York, N. Y., he joined the American Brown Boveri Electric Corporation, Camden, N. J., where he was employed as

A. J. Busch

L. G. Abraham

Percy Halpert

F. F. Shipley

rectifier engineer. In 1931 he accepted a position with the Allis-Chalmers Company which in that year acquired the Brown Boveri Company, supervising the design of rectifier equipment. Mr. Winograd is coauthor of the book, "Mercury-Arc Power Rectifiers,' is the author of several technical papers and the holder of a number of patents, and is now serving on the AIEE committee on electronics.

G. L. Moses (A '43, M '44) manager, development insulation section, a-c engineering department, transportation and generator division, Westinghouse Electric Corporation, East Pittsburgh, Pa., has received honorable mention in the 1944 national best paper prize award in theory and research, as coauthor of the paper, "Effect of Altitude on Electric Breakdown and Flashover of Aircraft Insulation." He graduated from the Bliss Electrical School in 1923 and has been with the Westinghouse Corporation since that time. In 1923 he was a student in the graduate training course, in 1924 he became sales correspondent of railway sales, later was promoted to railway control engineer, and in 1937 he became coil and insulation engineer in the transportation and generator engineering department. In 1942 he was named engineer in charge, insulation development group, transportation and generator engineering department. Mr. Moses has contributed a number of papers to technical publications.

A. M. Stiles (A '43) engineer, rectifier section, a-c generator engineering department, Westinghouse Electric Corporation, East Pittsburgh, Pa., has received honorable mention in the national 1944 best paper prize in theory and research, as coauthor of the paper, "Effect of Altitude on Electric Breakdown and Flashover of Aircraft Insulation." He received the degree of bachelor of science in electrical engineering from Iowa State College in 1941 and was awarded the master-of-science degree in electrical engineering from Carnegie Institute of Technology in 1942. In 1941 he was a graduate research fellow and assisted in faculty research at the Carnegie Institute of Technology, Pittsburgh, Pa., and in 1942 became a special graduate student engineer for the Westinghouse Corporation, assigned to the insulation department of the research laboratories. In that same year he was made a junior research engineer, working in insulating materials and allied fields of electrical measurements.

F. J. Maginniss (A '43) central-station engineering division, General Electric Company, Schenectady, N. Y., has received honorable mention in the 1944 best paper prize award for initial paper as coauthor of "Transient Performance of Induction Motors." He was graduated with the degree of bachelor of science from New York University in 1937 and received the master-of-science degree from the University of Pennsylvania in 1940. In 1939 he became research assistant, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, and in 1940 accepted the position as junior physicist, Frankford Arsenal, Philadelphia. In 1941 he became associated with the General Electric Company as electrical engineer in charge of the operation of the differential analyzer.

N. R. Schultz (A '40) electrical engineer, central-station engineering division, General Electric Company, Schenectady, N. Y., has received honorable mention in the 1944 national best paper prize award for initial paper, as coauthor of "Transient Performance of Induction Motors." Mr. Schultz was graduated from the University of Colorado in 1939 with a bachelor-of-science degree and in that year became student engineer, testing electrical equipment in the General Electric Company. In 1941 he was transferred to the central-station engineering division.

P. B. Garrett (A '24, M '30) formerly of the northwestern engineering division of the Westinghouse Electric Corporation, Chicago, Ill., has become editor of *Electric Light and Power*, Chicago. A graduate of Colorado State College, Mr. Garrett joined the Westinghouse Company as a student engineer about 1922 and has served since as district engineer in San Francisco, Calif., and as general engineer in the Salt Lake City, Utah, and Butte, Mont., territories of the company.

C. C. Rathgeb (A '21, M '23) formerly vice-president and managing director, Canadian Comstock Company, Ltd., Toronto, Ontario, Canada, has been appointed president of the company. Mr. Rathgeb, who was born in Port Chester, N. Y., in 1892, joined the company in New York, N. Y., as assistant superintendent of construction in 1910. He became superintendent of construction about 1920 and was appointed vice-president in 1926.

W. W. Parker (A '30, M '37) electrical engineer, Westinghouse Electric Corporation, East Pittsburgh, Pa., has been appointed regional engineer of the Rio de Janeiro office of the Westinghouse Electric International Company. Mr. Parker joined the Westinghouse Company as a member of the student engineering course upon his graduation from Sheffield Scientific School of Yale University in 1927 and later was transferred to the switchgear division.

J. K. Bradford (A '33) lieutenant colonel, Canadian Active Service Force, has returned to the staff of Canada Wire and Cable Company, Ltd., Toronto, Ontario, Canada. Colonel Bradford enlisted as a lieutenant in 1939, served in Sicily and Italy with the Royal Canadian Engineers, and was detached for special duty in the Normandy landing. He has received the Order of the British Empire.

A. F. Morairty (A '43) vice-president, Central Arizona Light and Power Company, Phoenix, has been given charge of public-relations work, postwar planning, and industrial development as the result of a recent reassignment of duties among the company's executives. **G. G. Groh** (M '43) general superintendent, has been given the additional duties of chief engineer in charge of all operations, construction, and maintenance.

T. H. Crosby (M '37) district manager, Canadian Westinghouse Company, Ltd., Vancouver, British Columbia, Canada, has been elected president of the Electrical Service League of British Columbia.

OBITUARY

Philip Green Gossler (A '94, M '98, F '13) chairman of the board, Columbia Gas and Electric Corporation, New York, N. Y., died May 18, 1945. Born at Columbia, Pa., August 6, 1870, Mr. Gossler received the degrees of bachelor of science in 1890 and electrical engineering in 1892 from Pennsylvania State College. He accepted positions wih the Chester (Pa.) Foundry and Machine Company, and the Edison General Electric Company, New York, between the years 1890–91, and then became assistant engineer of the United Electric Light and Power Company, New York. From 1895 to 1901 he was superintendent and engineer of the Royal Electric Company, Montreal, Quebec, Canada, and in the latter year left to become general superintendent and engineer for the Montreal Light, Heat and Power Company. In 1904 he was named vice-president of J. G. White and Company, New York, and in 1909 became chairman of the board of the Columbia Gas and Electric Company, which was the nucleus of the Columbia system developed under his leadership. In 1926 Mr. Gossler helped direct the merger of the Ohio Corporation and Columbia into the Columbia Gas and Electric Corporation. He served as president of the corporation from 1926 until 1936, when he became chairman of the board. He was a director of the Guaranty Trust Company, trustee of the Edison Electric Institute, former vice-president of the Edison Pioneers and the New York Electrical Society, and a member of the American Gas Association, and Association of Edison Illuminating Companies. He has served as a member of the AIEE committees on local organizations, National Electric Code, and conservation of natural resources.

Bradley Thomas McCormick (A '04, M '09, F '13) electrical engineer, Wagner Electric Corporation, St. Louis, Mo., died April 20, 1945. He was born May 28, 1880, in Marietta, Ohio, and received his education at Cornell University, graduating in 1903 with the degree of mechanical engineer. In 1903 he entered the employ of the Bullock Electric Manufacturing Company, Cincinnati, Ohio, where he received a training course in the shops and later was transferred to the engineering department as design engineer. In 1906 he accepted the position as chief electrical engineer of Allis-Chalmers–Bullock, Ltd., Montreal, Quebec, Canada, in charge of the electrical and mechanical design of electric machinery, and from 1913 until 1915 he was a member of the firm Forbes and McCormick, Montreal. Between the years 1915–17, he was chief engineer of the Mississippi Valley Metal Products Company, St. Louis, Mo., and during World War I, served as a captain and was advanced to the rank of major in the Ordnance Department of the United States Army. In 1919 he became associated with the Wagner Electric Corporation, where, until his death, he alternated between the positions of supervisor of the small-motor engineering department and assistant to the consulting engineer. He was active in the AIEE St. Louis Section and for several years was chairman.

Claude Joseph Holslag (M '19, F '41) president, Electric Arc Cutting and Welding

Company, Newark, N. J., died June 11, 1945. Born at Addison, N. Y., in 1885, he was graduated from Columbia University in 1908 with a degree in electrical engineering. After graduation he entered the electrical-engineering department of the New York Central Railroad, later becoming resident engineer at Amsterdam, N. Y., working on the experimental track there. He continued with the railroad as assistant electrical engineer until 1918, but also was associated with organizations engaged in the manufacture of electrodes since 1915, having helped to organize the Steinbach Electric Company (renamed the Splitdorf Electric Company in 1917). At that time he acted as general manager and later chief engineer. When the Steinbach Company became the Electric Arc Cutting and Welding Company in 1918, Mr. Holslag was named president. He was awarded the Samuel Wylie Miller Medal in 1938 and the Modern Pioneer Award in 1940. Mr. Holslag was a member of the American Electrochemical Society, American Welding Society, the National Electrical Manufacturers Association, and was on the board of managers for the Columbia Engineering School. He was the holder of many patents in the welding industry, and he served as a member of the AIEE committee on electric welding from 1927 to 1931 and from 1934 to 1939.

George Curtis Barney (M '37) operation and engineering department, American Telephone and Telegraph Company, New York, N. Y., died May 11, 1945. Mr. Barney was born at Berlin, N. H., April 21, 1899. In 1917 he left the University of Maine to join the United States Naval Reserve and served during World War I as second in charge of a radiotelegraph station at Poitiers, France. During the winter of 1920–21 he was in charge of radiotelegraph operations at Vienna, Austria, for the United States War and Navy Departments. In 1921 he returned to the United States and resumed his studies at the University of Maine from which he was graduated in 1924. On leaving college, he joined the New England Telephone and Telegraph Company, Providence, R. I., in 1927 was made division transmission engineer, and in 1929 transferred to the transmission-engineering section of the American Telephone and Telegraph Company, New York. From 1935 until 1938 he served in Europe as assistant to the technical representative of that company and Bell Telephone Laboratories, Inc., with headquarters at London, England. Upon completion of this work, he returned to the American Telephone and Telegraph Company and in 1942 was transferred to the foreign-wire-relations section. He was a member of the Telephone Pioneers of America.

Harry C. Brown (A '20) planning engineer, Crossett (Ark.) Paper Mills, died February 21, 1945. Born July 2, 1890, at Amherst, N. J., he was graduated from McGill University in 1917 with a bachelor-of-science degree in electrical engineering. In 1918 he accepted a position working with power and cable design for the Northern Electric Company, Montreal, Quebec, Canada, in 1919 he was transferred to station-design work for the Hydro-Electric Power Commission, Toronto, Ontario, Canada, and in 1920 became electrical engineer for the Belgo Canadian Pulp and Paper Company, Ltd., Shawinigan Falls, Quebec. In 1924 he worked in the same capacity for the Newfoundland Power and Paper Company, Corner Brook, and was advanced to manager of power development in 1926. He left in 1929 to accept the appointment of electrical engineer for the manufacturing department of the International Paper Company, New York, N. Y., and later was promoted to chief electrical engineer. In 1937 Mr. Brown was an electrical engineer at the New York (N. Y.) World's Fair, Inc., in 1941 he was affiliated with the Union Bag and Paper Corporation, Savannah, Ga., and in 1943 became associated with the Crossett Paper Mills.

Samuel Albert Spalding (A '05, F '29) chief engineer, Gibbs and Hill, New York, N. Y., died May 25, 1945. Born February 23, 1873, in Danvers, Mass., Mr. Spalding was graduated with the degree of bachelor of electrical engineering in 1894 from Tufts College. In 1896 he became assistant engineer with the Brooklyn (N. Y.) Rapid Transit System, in 1903 accepted the position of transmission engineer for the New York Central System, New York, N. Y., engaged in the electrification of Grand Central Terminal, and in 1904 returned to the Rapid Transit System to become superintendent of power. In 1909 he served as assistant engineer with the Pennsylvania Tunnel and Terminal Railroad Company, New York, N. Y., and in 1910 was appointed chief engineer for Gibbs and Hill. As chief engineer, Mr. Spalding supervised such projects as the electrification of the Pennsylvania Railroad and the Virginian Railway and was consultant in connection with the Illinois Central Railroad electrification and the design and construction of electrification of the New York Connecting Railroad. He served as a member on the AIEE transportation committee and the board of examiners.

Warren Rhodes Hill (A '24) chief electrical engineer, Aluminum Company of America, Edgewater, N. J., died April 11, 1945. Born April 17, 1895, at Nashua, N. H., Mr. Hill was graduated with the degree of bachelor of science in electrical engineering from Worcester Polytechnic Institute in 1922. Upon graduation he became assistant engineer, engineering department, for the United Electric Light and Power Company, New York, N. Y., and subsequently was named assistant engineer, design division, transmission and distribution department of that company. He was employed by the company for several years until he accepted a position in the same capacity for the New York Edison Company, New York, and he remained with that company as assistant engineer when it became the Consolidated Edison Company of New York, Inc., in 1936. He was associated with the Edison Company until 1944 at which time he was appointed chief electrical engineer for the Aluminum Company of America.

Clayton A. Barger (A '44) field engineer, American Ship Building Company, Cleveland, Ohio, died April 2, 1945. He was born October 11, 1892, at Spring Mills, Pa., and in 1911 became an electrical apprentice for the Cambria Steel Company, Johnstown, Pa. From 1915 to 1920 he was associated with the American Ship Building Company, Lorain, Ohio, first as an electrician and subsequently as maintenance foreman. In 1921 he organized his own company and in 1926 returned to the American Ship Building Company, Cleveland, as assistant chief electrician, where he remained until 1931. In 1932 he was appointed sales manager for the Genuine Auto Parts Company, Lorain, in 1938 became general foreman for Germaine and Smith, general contractors, Hiram, Ohio, and in 1942 again returned to the American Ship Building Company, in the Buffalo (N. Y.), and Lorain offices, where he was chief electrician and later field engineer.

Lionel Hoechstetter (A '35) engineering department, Fairchild Aircraft Corporation, Hagerstown, Md., died May 8, 1945. He was born October 1, 1909, at Pittsburgh, Pa., and received his education at Carnegie Institute of Technology, graduating in 1932 with a bachelor-of-science degree in electrical engineering. In 1933 he became manager of the radio department for McCreery and Company, Pittsburgh, and left in 1934 to do inventory work with M. R. Scharff, consulting engineer, New York, N. Y. In 1935 he accepted the position of property record engineer, Westchester Lighting Company, New York, and in 1936 was promoted to junior engineer. In 1937 he was appointed electrical engineer for the Electricoil Company, New York, in which position he remained until 1941, when he became associated with the Fairchild Aircraft Corporation as an electrical engineer.

Harold Childs Pease (A '03) designing engineer engaged in war work, Armstrong Cork Company, Lancaster, Pa., died May 5, 1945. Born in Charlestown, Mass., in 1874, he attended Cornell University and was graduated with a degree in electrical engineering in 1897. He became associated with the General Electric Company, Schenectady, N. Y., soon after graduation, and in 1922 was transferred to the Erie (Pa.) plant as assistant engineer of the control department. He was subsequently made manufacturing engineer of drum controls and remained in that capacity until he was retired from the General Electric Company in 1936. In that same year he joined the Hamilton Watch Company, Lancaster, as experimental engineer of the machine experimental department and retired from that company in 1942, at which time he entered the employ of the Armstrong Cork Company.

Christopher Meyer Lowther (A '00) retired electrical engineer, New York, N. Y., died April 12, 1945. He was born in New York, May 7, 1874, and was graduated from Columbia University in 1898 with the degree of electrical engineer. Early in his career he served the Bank of New Amsterdam, New York, N Y., and after graduation from the university he entered the employ of the Static Carbonating Company, working on liquefied-carbonic-acid pressure gauges and on machines. He left to become associated with the Crocker-Wheeler Electric Manufac-

turing Company, Ampere, N. J., where he did special testing, draughting and engineering, and was later promoted to sales engineer. Mr. Lowther left the Crocker-Wheeler Company to represent the Duncan Meter Company, New York, N. Y., and later continued activities for Lowther and Sons, a coal business founded by his father.

Truman Preston Brewster (M '44) superintendent of telegraph, Atchison, Topeka, and Sante Fe Railway Company, Chicago, Ill., died January 7, 1945. He was born January 28, 1893, at Azusa, Calif. He was first associated with the company in 1925, when he accepted the position of telegraph and telephone supervisor at Los Angeles, Calif. In 1929 he was promoted to assistant superintendent, in direct charge of communications personnel and facilities for the lines west of Albuquerque, N. Mex. In 1929 Mr. Brewster was transferred to the Chicago offices to become superintendent in charge of the telegraph department, embracing all communication personnel, construction, maintenance, and operation.

William Samuel Booth (A '44) lieutenant, junior grade, United States Naval Reserve, died May 3, 1945 while on active duty. Lieutenant Booth was born September 18, 1920, in Cambridge, Ohio, and was graduated from Ohio State University in 1943 with a degree in electrical engineering. Upon graduation, he was commissioned an ensign, United States Naval Reserve, and was assigned to duty as administrative assistant for the Naval Research Laboratory, Washington, D. C. His work consisted of all phases of radio research and development, and preparation of technical reports and monographs on all types of radio equipment. He was advanced to the rank of lieutenant, junior grade, in 1944. He was an associate of the Institute of Radio Engineers.

Andrew J. Symbolie (A '42) electrician, Watervliet (N. Y.) Arsenal, died in April 1945. He was born February 22, 1891, at Troy, N. Y. In 1906 he became an electrical contractor for E. G. Benard of Troy and in 1915 worked in the same capacity for H. L. Jewell, Albany, N. Y. In 1916 he served in the United States Army, and in 1917 went in business for himself as an electrical contractor. In 1918 he accepted the position as electrician for the Watervliet Arsenal, left there in 1920 to go on with his own business, and returned to the Arsenal in 1939 to become leader electrician.

Robert Rieman Harvey (A '95) retired electrical engineer, died February 20, 1945, at Wilkes-Barre, Pa. He was born on December 1, 1871, at Wilkes-Barre, and was graduated with a bachelor-of-science degree from Lehigh University in 1895. In 1896 Mr. Harvey became associated with the Westinghouse Electric and Manufacturing Company in the capacity of electrical engineer, first with their offices in Pittsburgh, Pa., and subsequently in Buffalo, N. Y. In 1898 he became general superintendent for the Columbia Mills, Inc., Wilkes-Barre and in later years retired from that position.

MEMBERSHIP • • •

Recommended for Transfer

The board of examiners, at its meeting on May 24, 1945, recommended the following members for transfer to the grade of membership indicated. Any objections to these transfers should be filed at once with the national secretary.

To Grade of Fellow

Griffith, H. C., asst. chief engr., Pennsylvania Railroad, Philadelphia, Pa.

1 to grade of Fellow

To Grade of Member

Armstrong, J. F., asst. to general supt., El Paso Elec. Co., El Paso, Texas
Barnes, F. P., district representative, General Elec. Co., San Francisco, Calif.
Berry, W. S., asst. elec. engr., Underwriters Labs., Inc., New York
Berting, G. A., asst. to pres., The North Electric Mfg. Co., Galion, Ohio
Bonine, C. E., consulting engr., Philadelphia, Pa.
Bound, P. T., engr., Canadian Westinghouse Co. Ltd., Hamilton, Ont.
Brancato, E. L., assoc. elec. engr., U. S. Navy Yard, Brooklyn, N. Y.
Canning, G. R., protection engr., Ohio Bell Tel. Co., Cleveland, Ohio
Corwith, H. P., asst. chief engr., Western Union Telegraph Co., New York
Currie, G. J., plant training supervisor, Ohio Bell Tel. Co., Cleveland, Ohio
Darcey, J. F., supt. of maintenance and distribution, Capital Transit Co., Washington, D. C.
Daugherty, Frank, pres. and chief engr., Scofield Engg. Co., Philadelphia, Pa.
Daugherty, R. H., engr., American Tel. & Tel. Co., New York
Deardorff, H. E., supervisor, Dayton Power & Light Co., Dayton, Ohio
Diemond, C. C., chief, Relay Unit, Bonneville Pwr. Administration, Portland, Oreg.
Dobrick, F. S., engr. in charge, Reliance Elec. & Engg. Co., Cleveland, Ohio
Dodds, G. B., relay protection engr., Duquesne Light Co., Pittsburgh, Pa.
Dougherty, H. P., division plant supt., Southwestern Bell Tel. Co., St. Louis, Mo.
Evans, S. O., elec. engr., Babcock & Wilcox Tube Co., Beaver Falls, Pa.
Ferree, H. M., test supervisor, General Elec. Co., Cleveland, Ohio
Fuller, J. L., experimental engr., Reliance Elec. & Engg. Co., Cleveland, Ohio
Gilbert, P. G., district engg. div., Westinghouse Elec. Corp., Philadelphia, Pa.
Green, R. C., elec. engr., Naval Ordnance Lab., Navy Yard, Washington, D. C.
Guildford, R. P., Middle Atlantic electrical supt., Westinghouse Elec. Corp., Philadelphia, Pa.
Guldi, F. G., engr., Public Service Elec. & Gas Co., Newark, N. J.
Harris, J. B., pres., Rumsey Elec. Co., Philadelphia, Pa.
Headley, F. L., district mgr., General Elec. Co., Philadelphia, Pa.
Hemeter, L. H., service engr., Aluminum Company of America, Pittsburgh, Pa.
Hines, C. M., elec. engr., Westinghouse Air Brake Co., Wilmerding, Pa.
Hull, R. B., chief electrician, General Motors Corp., Anderson, Ind.
Inman, D. E., Engg. & Service Mgr., Westinghouse Elec. Corp., Cleveland, Ohio
Kanzler, W. H., Chief, Engg. and construction div., Bonneville Pwr. Administration, Portland, Oreg.
Kirk, E. L., elec. engr., Dow Chemical Co., Midland, Mich.
Lang, J. S., elec. engr., Automatic Temperature Control Co., Philadelphia, Pa.
Leonard, S. E., engr.-in-charge, National Broadcasting Co. Inc., Cleveland, Ohio
Martin, H. C., vice-pres. and chief engr., The Ambos-Jones Co., Cleveland, Ohio
Marx, C. J., engr., Reliance Elec. & Engg. Co., Cleveland, Ohio
Moss, S. A., general plant supervisor, Chesapeake & Potomac Tel. Co., Washington, D. C.
Myles, A. H., asst. chief engr., Elec. Controller & Mfg. Co., Cleveland, Ohio
Oetting, R. L., illuminating engr., General Elec. Co., Cleveland, Ohio
Orcutt, H. S., industrial engr., Federal Tel. & Radio Corp., Clifton, N. J.
Perry, M. L., associate elec. engr., Black & Veatch, Kansas City, Mo.
Phelps, H. S., engr., Philadelphia Elec. Co., Philadelphia, Pa.
Picking, J. W., electronics development engr., Reliance Elec. & Engg. Co., Cleveland, Ohio
Plumley, H. J., physicist, Naval Ordnance Lab., Washington, D. C.
Porter, W. J., engr.-in-charge, Small Motor Engg. Dept., Canadian Westinghouse Co., Hamilton, Ont.
Schlough, F. H., engr. of equipment, Bell Tel. Co. of Pa., Pittsburgh, Pa.
Schmidt, A. W., asst. chief, Bureau of Reclamation, Denver, Colo.
Setter, J. A., industrial elec. engr., General Elec. Co., Denver, Colo.
Short, H. D., elec. engr., Canada Wire & Cable Co. Ltd., Toronto, Ont.
Slemmer, W. E., transmission and distribution engr., Public Service Co. of Oklahoma, Tulsa
Staller, A. W., factory manager, Crescent Insulated Wire & Cable Co., Trenton, N. J.
Stocker, C. P., vice-president and chief engr., Lorain Products Corp., Lorain, Ohio
Swanson, E. H., supervisor, research & development lab., S. S. White Dental Co., Staten Island, N. Y.
Threm, A. G., laboratory technician, Public Service Elec. & Gas Co., Maplewood, N. J.
Tiernan, T. F., elec. engr., American District Telegraph Co., New York
Tovee, E. H., elec. engr., Canadian Westinghouse Co. Ltd., Hamilton, Ont.
Trant, J. L., chief engr., The Brown-Brockmeyer Co., Dayton, Ohio
Van Lund, J. A., design and development engr., General Elec. Co., Pittsfield, Mass.
Vogeler, R. A., mgr., Federal Tel. & Radio Corp., Chicago, Ill.
Weesner, R. J., D. C. product development engr., Reliance Elec. & Engg. Co., Cleveland, Ohio
Winsor, L. P., instructor, Case School of Applied Science, Cleveland, Ohio

62 to grade of Member

The board of examiners, at its meeting on June 14, 1945, recommended the following members for transfer to the grade of membership indicated. Any objections to these transfers should be filed at once with the national secretary.

To Grade of Fellow

Boyce, F. G., vice-president in charge of construction and operation of power plants, Consumers Power Co., Jackson, Mich.
Cook, L. E., general engr., Ebasco Services, Inc., New York
Crumpton, W. J., member of patent staff, Bell Tel. Labs., Inc., New York
Edison, O. E., prof. of elec. engg., Univ. of Nebraska, Lincoln, Nebr.
Hamilton, H. C., head of test & research section, Boston Edison Co., Boston, Mass.
Lumley, C. S., engg. mgr., Smith, Hinchman & Grylls, Inc., Detroit, Mich.
Norris, F. W., prof. of elec. engg., Univ. of Nebraska, Lincoln, Nebr.
Rotty, O. J., system supt., Union Electric Co. of Missouri, St. Louis, Mo.
Sels, H. K., transmission & substation engr., Public Service Elec. & Gas Co., Newark, N. J.
Taylor, D. W., asst. elec. engr., Public Service Elec. & Gas Co., Newark, N. J.
Wilbraham, R. W., chief elec. engr., United Engineers & Constructors, Inc., Philadelphia, Pa.
Zworykin, V. K., associate research director, RCA Labs., Princeton, N. J.

12 to grade of Fellow

To Grade of Member

Austin, D. R., consulting elec. engr., Radar Section, S. A. Defence Force, Johannesburg, So. Africa
Bailey, C. A., designing engr., General Elec. Co., Schenectady, N. Y.
Bender, J. B., technical inspection supervisor, Emerson Elec. Mfg. Co., St. Louis, Mo.
Best, P. B., application engr., A. G. Redmond Co., Owosso, Mich.
Betz, P. L., research engr., Consolidated Gas, Elec. Lt. & Pwr. Co., Baltimore, Md.
Bloomquist, W. C., application engr., General Elec. Co., Schenectady, N. Y.
Buck, A. M., elec. engr., Weyerhaeuser Timber Co., Everett, Wash.
Buess, L. E., technical field engr., General Elec. Co., Cleveland, Ohio
Cantwell, J. L., development engr., General Elec. Co., Pittsfield, Mass.
Cartmell, A. W., elec. engr., Pasadena Light & Power Co., Pasadena, Calif.
Chappuis, C. K., major, Air Corps, U. S. Army, Washington, D. C.
Clark, C. N., distribution section engr., Duquesne Light Co., Pittsburgh, Pa.
Clarke, H. A., elec. engr., Appalachian Electric Power Co., Charleston, W. Va.
Clements, S. E., Major, Signal Corps, Washington, D. C.
Cobert, C. S., application engr., Clark Controller Co., Cleveland, Ohio
Crever, F. E., asst. division engr., General Elec. Co. Schenectady, N. Y.
Daniels, H. C., plant engr., Chase Brass & Copper Co., Cleveland, Ohio
Feeney, R. J., elec. engr., The Ohio Public Service Co., Elyria, Ohio
Flynn, J. V., application engr., Master Electric Co., Dayton, Ohio
Goss, F. L., engr. of overhead distribution, Dept. of Water & Power, City of Los Angeles, Calif.
Greenleaf, E. R., transmission and outside plant engr., Chesapeake & Potomac Tel. Co., Washington, D. C.
Hall, J. I., elec. engr., Trumbull Elec. Mfg. Co., Plainville, Conn.
Hall, W. G., mgr. of renewal parts div., Reliance Elec. & Mfg. Co., Cleveland, Ohio
Hancock, M. S., mgr. of engg., Westinghouse Elec. Corp., E. Pittsburgh, Pa.
Hardenbergh, B., distribution supt., The Ohio Public Service Co., Lorain, Ohio
Hubbell, M. F., Major, Ordnance Dept., St. Louis, Mo.

Johnson, I. B., research and development, General Elec. Co., Schenectady, N. Y.
Kennedy, E. R., chief draftsman, Puget Sound Bridge & Dredging Co., Seattle, Wash.
Kent, P. J., chief engr., Chrysler Corp., Detroit, Mich.
Koch, C. J., engr., General Elec. Co., Schenectady, N. Y.
Kutcher, W. J., elec. engr., Electrical Controller & Mfg. Co., Cleveland, Ohio
Lang, W. Y., member of technical staff, Bell Tel. Labs., Inc., New York
Ludwick, W. L., director, technical div., The Peck, Stow & Wilcox Co., Southington, Conn.
McLachlan, W. J., engr., General Elec. Co., Schenectady, N. Y.
Metcalf, E. C., machinery inspector, Fidelity & Casualty Co. of N. Y., Omaha, Nebr.
Nowacki, L. M., asst. section engr., General Elec. Co., Schenectady, N. Y.
O'Connor, J. V., elec. engr., Carbide & Carbon Chemicals Corp., Oak Ridge, Tenn.
Phillips, A. F., senior engr., Duquesne Light Co., Pittsburgh, Pa.
Preston, W. F., asst. chief engr., Cia Aux de Empresas Eletricas Brasileiras, Brazil, So. America
Quick, D. M., asst. engr., Public Service Elec. & Gas Co., Newark, N. J.
Raysdale, W. H., field service engr., General Motors Corp., Flint, Mich.
Scholz, W. E., engr., Philadelphia Elec. Co., Philadelphia, Pa.
Shere, G. D., chief engr., Electrical Specialty Co., Boston, Mass.
Sherman, K. S., transmitter engr., WGAR Broadcasting Co., Cleveland, Ohio
Simpson, J. H., junior research engr., National Research Council, Ottawa, Ont., Canada
Smith, H. C., maintenance and circuit engr., The Ohio Bell Tel. Co., Cleveland, Ohio
Spinks, A. W., associate physicist, National Bureau of Standards, Washington, D. C.
Stewart, J. A., Major, Signal Corps, San Francisco, Calif.
Thompson, Ernest, elec. engr. and associate, E. A. Schmidt & Co., St. Louis, Mo.
Thurman, A. L., steel mill application engr., General Elec. Co., Schenectady, N. Y.
Uffelman, W. R., district mgr., Bodine Electric Co. of Chicago, Cleveland, Ohio
Whitman, L. C., development engr., General Elec. Co., Pittsfield, Mass.
Wyeth, F. H., elec. engr., Leeds & Northrup Co., Philadelphia, Pa.
Yost, I. A., mgr. of engg., Westinghouse Elec. Corp., Cleveland, Ohio

54 to grade of Member

Applications for Election

Applications have been received at headquarters from the following candidates for election to membership in the Institute. Any member objecting to the election of any of these candidates should so inform the national secretary before August 15, 1945 or October 15, 1945, if the applicant resides outside of the United States or Canada.

To Grade of Member

Bank, M. L., Fischbach & Moore of Texas, Inc., Dallas, Texas
Berget, E. A., 1st Lieut., U.S.M.C., San Diego, Calif.
Bhasin, O. P., United Provinces Govt., Roorkee, India
Bovey, D. E., Woodward Governor Co., Rockford, Ill.
Churchill, W. W., Gen. Elec. Co., Schenectady, N. Y.
Clinton, J. S., Salisbury Electricity Dept., Salisbury, Southern Rhodesia
Cunningham, C. T., Reconstruction Fin. Corp., Washington, D. C.
Dana, H. J., Wash. State Col., Pullman, Wash.
Dovey, E. J., Duquesne Light Co., Pittsburgh, Pa.
Duryea, H. (Re-election), Commonwealth & Southern Corp., Birmingham, Ala.
Earl, R. B., Jr., D. R. Warren Co., San Francisco, Calif.
Frank, W. H., Bulldog Elec. Prod. Co., Detroit, Mich.
Holsgrove, H. E., A. C. Cossor, Ltd., London, England
Jamison, G. B., Crouse Hinds Co., Houston, Texas
Kressly, M. E., Gilbert Associates, Inc., Reading, Pa.
Kumar, S. S., Public Works Dept., Lahore, Punjab, India
Lauder, D. H., Gen. Elec. Co., Schenectady, N. Y.
Lewis, R. R., Tenn. Val. Auth., Watts Bar Dam, Tenn.
Makous, L. (Re-election), A. O. Smith Corp., Milwaukee, Wis.
Manning, C. H., Ogden A.T.S.C., Ogden, Utah
Mansfield, W. A. (Re-election), Conduits & Elec. Raceways, Ltd., Toronto, Ont., Can.
Mason, C. M. (Re-election), Cincinnati & Sub. Bell Tel. Co., Cincinnati, Ohio
Miller, N. A. (Re-election), Sargent & Lundy, Chicago, Ill.
Miller, R. H., Gen. Elec. Co., Des Moines, Iowa
Molenaar, C. R., U.S.E.D., Oak Ridge, Tenn.
Morgan, R. I., A. Reyrolle & Co., Ltd., Durham, England
Nilsen, P. J., P. J. Nilsen Co., Oak Park, Ill.
Norman, R. W., Rural Elect. Adm., St. Louis, Mo.
O'Connor, A. J. (Re-election), Wis. Elec. Pr. Co., Milwaukee, Wis.
Parcinski, H. J. (Re-election), Princeton Univ., Princeton, N. J.
Pettigrew, J. (Re-election), Press Wireless, Inc., New York, N. Y.
Podolsky, L., Sprague Prod. Co., North Adams, Mass.
Santos, P. J., Parsons, Brinckerhoff, Hogan & MacDonald, Caracas, Venez., S. A.
Skeen, J. H., U. S. Rubber Co., New York, N. Y.
Talmadge, P. C., RBM Mfg. Co., Logansport, Ind.
Taylor, R. F., Cons. Engr., Houston, Texas
Veit, A. C., County of Los Angeles, Los Angeles, Calif.
Weiner, A., 2 W. 83rd St., New York, N. Y.
Woollaston, A. E., Johnson & Phillips, Ltd., Charlton, London, England

39 to grade of Member

To Grade of Associate

United States and Canada

1. North Eastern

Anthony, H. H., Robt. H. Anthony Co., Boston, Mass.
Brown, W., United Cinephone Corp., Torrington, Conn.
Davis, P. C. (Re-election), Westinghouse Elec. Corp., Boston, Mass.
Edgerton, A. K., Research Const. Co., Cambridge, Mass.
Gomez, J. E., Gen. Elec. Co., Schenectady, N. Y.
Johnson, C. F., Gen. Elec. Co., Pittsfield, Mass.
Lott, A. L., Airadio, Inc., Stamford, Conn.
Munro, L. M., Doble Engg. Co., Medford Hillside, Mass.
Nerenberg, A. C., Curtiss-Wright Res. Lab., Buffalo, N. Y.
Norton, E. G., Robt. H. Anthony Co., Boston, Mass.
Quenell, A. W., Gen. Elec. Co., Boston, Mass.
Ragan, F. T., Jr., Lieut. (jg) U.S.N.R Portsmouth, N. H.
Van Valkenburg, M. E., Mass. Inst. of Tech., Cambridge, Mass.

2. Middle Eastern

Adams, C. A., Gilbert Associates, Inc., Reading, Pa.
Beiner, R., Philco Radio Corp., Washington, D. C.
Bevan, C. B., Phila. Elec. Co., Chester, Pa.
Buchanan, D. L., Alum. Co. of America, Newark, Ohio
Carmona, V. S., Westinghouse Elec. Corp., East Pittsburgh, Pa.
Caywood, W. P., Carnegie Inst. of Tech., Pittsburgh, Pa.
Cozzarin, V. J., Westinghouse Elec. Corp., Cleveland, Ohio
de Masi, R. R., Chesapeake & Potomac Tel. Co., Washington, D. C.
Eschbach, D. O. (Re-election), Gilbert Associates, Inc., Reading, Pa.
Frederick, J. J., Gilbert Associates, Inc., Reading, Pa.
Gallen, H. R., Phila. Elec. Co., Philadelphia, Pa.
Gates, E. S., Westinghouse Elec. Corp., Sharon, Pa.
Gilkey, G. A., Westinghouse Elec. Corp., Sharon, Pa.
Goodell, L. J., Westinghouse Elec. Corp., Lima, Ohio
Groetzinger, C. A., Leece-Neville Co., Cleveland, Ohio
Haddy, H. P., Phila. Elec. Co., Norristown, Pa.
Hedding, L. K., Union Switch & Sig. Co., Swissvale, Pa.
Hervey, G. H., Leland Elec. Co., Dayton, Ohio
Holden, R. A., Phila. Elec. Co., Philadelphia, Pa.
Howland, R. A., Briggs Clarifier Co., Washington, D. C.
Hughes, K. M., Union Switch & Sig. Co., Swissvale, Pa.
Kane, J. T., U. S. Navy Yard, Philadelphia, Pa.
Krone, N. J., Jr., Chesapeake & Potomac Tel. Co., Washington, D. C.
Mann, A., Reliance Elec. & Engg. Co., Cleveland, Ohio
McDowell, G. R., Westinghouse Elec. Corp., Sharon, Pa.
Myers, R. J., Phila. Elec. Co., Philadelphia, Pa.
Nash, A. R., Phila. Elec. Co., Chester, Pa.
Pflieger, A. B. (Re-election), Dravo Corp., Wilmington, Del.
Shellberg, S. G., Jr., Goodyear Tire & Rubber Co., Akron, Ohio
Spayd, R. S., Gilbert Associates, Inc., Reading, Pa.
Taylor, W., Jr., Phila. Elec. Co., Philadelphia, Pa.
Thacker, H. C., Master Elec. Co., Dayton, Ohio
Trainham, J. S., Phila. Elec. Co., Philadelphia, Pa.
Werne, G. E., Westinghouse Elec. Corp., Sharon, Pa.
Wiegandt, K. M., Pa. Pr. & Lt. Co., Allentown, Pa.
Windshimer, H. W., Jr., Ohio Power Co., Bellaire, Ohio
Wright, H. E., Ensign, U.S.N.R., Washington, D. C.
Younkman, C. G., Amer. Tel. & Tel. Co., Dayton, Ohio

3. New York City

Dryden, J. C., Morganite Brush Co., Inc., Long Island City, N. Y.
Frazer, D. L., Westinghouse Elec. Intl. Co., New York, N. Y.
Hickey, L. J., Ward Leonard Elec. Co., Mount Vernon, N. Y.
Johnson, D. J., Jr., Maritime Switchboard, New York, N. Y.
Koelling, W. C., H. A. Fraser, Inc., New York, N. Y.
Martin, E. O., Westinghouse Elec. Corp., Newark, N. J.
Naybor, E. V., Sperry Gyro. Co., Inc., Great Neck, N. Y.
Perez, E. B., J. A. Tuck, Cons. Engr., New York, N. Y.
Smith, E. J., Lepel High Frequency Labs., New York, N. Y.
Weil, K., Espey Mfg. Co., Inc., New York, N. Y.

4. Southern

Byerley, J. L., J. A. Jones Const. Co., Inc., Knoxville, Tenn.
Eckmann, H. H. (Re-election), Commonwealth & Southern Corp., Birmingham, Ala.
Grayson, F. O., Mfg. Repr., Coral Gables, Fla.
Killingsworth, H. M., Gen. Elec. Co., Miami, Fla.
Legeai, R. F., New Orleans Pub. Serv., Inc., New Orleans, La.
Millican, H. G., O. V. Scott Elec., Atlanta, Ga.
Moreland, H. W., Fraser-Brace Engg. Co., Inc., Camden, Ark.
Newton, R. L., Amer. Tel. & Tel. Co., Richmond, Va.
Roselle, D. T., Southern Bell Tel. & Tel. Co., Miami, Fla.
Sanders, J. L., Jr., Fla. Pr. & Lt. Co., Sarasota, Fla.
Shipley, G. H., Southern Bell Tel. & Tel. Co., Miami, Fla.
Thayer, N. B. (Re-election), City Water & Light Plant, Jonesboro, Ark.
Thompson, L. H., U. S. Engr. Office, Kingsport, Tenn.
Travis, K. L., Clinton Engineer Works, Oak Ridge, Tenn.
Yoerger, E. J., U. S. Navy, New Orleans, La.

5. Great Lakes

Andersson, M. A., Pub. Serv. Co. of Northern Ill., Chicago, Ill.
Bartlett, H. W., Pub. Serv. Co. of Northern Ill., Chicago, Ill.
Beebe, N. R., Line Material Co., Milwaukee, Wis.
Birkey, V. G., Allis-Chalmers Mfg. Co., Minneapolis, Minn.
Borchelt, C. T., R. G. LeTourneau, Inc., Peoria, Ill.
Buehrig, T. F., Morton Elec. Serv. Co., Morton, Ill.
Cooper, R. B., Consumers Pr. Co., Grand Rapids, Mich.
Covington, C. J., Dowzer Elec. Mchy. Works, Mount Vernon, Ill.
Davis, L. J., Pub. Serv. Co. of Northern Ill., Glencoe, Ill.
Dulevich, N. C., Bendix Prod. Dif., South Bend, Ind.
Fogliatti, J. J., Detroit Public Works Dept., Detroit, Mich.
Getz, H. R., Keystone Steel & Wire Co., Peoria, Ill.
Goldstein, M., Amer. Television Labs., Chicago, Ill.
Kuder, R. C., Moe Bros. Mfg. Co., Fort Atkinson, Wis.
Lally, L. A., Gen. Elec. Co., Fort Wayne, Ind.
Levine, D. L., Commonwealth Edison Co., Chicago, Ill.
Lundquist, W. C., Travelers Ins. Co., Peoria, Ill.
Metz, J. (Re-election), Commonwealth Edison Co., Chicago, Ill.
Roof, R. B., Eaton Mfg. Co., Battle Creek, Mich.
Strong, I. W., Allison Div., General Motors Corp., Indianapolis, Ind.
Taylor, G. Y. (Re-election), Pub. Serv. Co. of Northern Ill., Evanston, Ill.
Tindell, N. W., Keystone Steel & Wire Co., Peoria, Ill.
Wasson, L. C., Mil. Gas Spec. Co., Milwaukee, Wis.
Wright, J. L., Jr., Wright Engg. Co., Indianapolis, Ind.

6. North Central

Black, H. A., U. S. Bur. of Reclamation, Denver, Colo.
Brooks, H. A., Pub. Serv. Co. of Colo., Boulder, Colo.

7. South West

Blackstone, L. B., Houston Ltg. & Pr. Co., Houston, Texas
Carter, G. H., Jr., Southwestern Pub. Serv. Co., Amarillo, Texas
Cline, G. W., Brown Shipbldg. Co., Houston, Texas
Hirsch, L. L., Gulf States Util. Co., Port Arthur, Texas
Klepinger, L. H., Curtiss-Wright Corp., St. Louis, Mo.
Lyford, W. T., Southwestern Pub. Serv. Co., Seagraves, Texas
Miller, R. P., Southwestern Pub. Serv. Co., Amarillo, Texas
Ogg, C. B., Amer. Tel. Tel. & Co., Wichita, Kans.
Pace, L. C., Gulf States Util. Co., Beaumont, Texas
Robinson, E. W., Southwestern Pub. Serv. Co., Amarillo, Texas
Rouse, R. N., Gulf States Util. Co., Beaumont, Texas
Shreve, W. P., Gen. Elec. Sup. Corp., Amarillo, Texas
Strom, M. E., Southwestern Pub. Serv. Co., Borger, Texas
Stull, C. V., J. E. Murray & Co., Kansas City, Mo.

8. Pacific

Bagwill, L. E., State Bridge Dept., Sacramento, Calif.
Buzolin, S. S., Marinship Corp., Sausalito, Calif.
Colon, P. R., Jr., Holmes & Narver, Los Angeles, Calif.
Davenport, M. E., Southern Calif. Edison Co., Ltd., Vernon, Calif.
Drescher, E. E., U. S. Naval Drydocks, San Francisco, Calif.
Ernsberger, W. P., 1st Lt., U. S. Army, Fresno, Calif.
Farrell, R. J., Ensign, U.S.N.R., c/o F.P.O., San Francisco, Calif.
Foster, E. M., San Diego Gas & Elec. Co., San Diego, Calif.
Fuller, R. L., Lockheed Aircraft Corp., Burbank, Calif.
Pierce, F. J., Hughes Aircraft Co., Culver City, Calif.
Price, J. P. (Re-election), Gen. Elec. Co., Fresno, Calif.
Shryock, C. S., Columbia Steel Co., Los Angeles, Calif.

9. North West

Beede, C. H., Seattle Lighting Dept., Seattle, Wash.
Brudick, W. E., Portland Gen. Elec. Co., Portland, Oreg.
Elliott, C. H., Alum. Co. of America, Mead, Wash.
Johnson, F. J., Portland Gen. Elec. Co., Portland, Oreg.
Pope, S. J., Alum. Co. of America, Spokane, Wash.

10. Canada

Gregory, E. S., B. C. Elec. Ry. Co., Ltd., Vancouver, B. C., Can.
Hovey, L. M. (Re-election), Winnipeg Elec. Co., Winnipeg, Man., Can.
Mayberry, F. C., Canadian Natl. Exhibition, Toronto, Ont., Can.

Elsewhere

Aspillaga F., L. E., Valparaiso St., Vina del Mar, Chile, S. A.
Frese, R., Jr., Veracruz Elec. Lt., Pr. & Trac., Ltd., Veracruz, Mex.
Humphries, P. W., Standard Tels. & Cables, Wellington, N. Z.
Ray, J. A., U. S. Navy Yard, Pearl Harbor, T. H.

Total to grade of Associate
United States and Canada, 136
Elsewhere, 4

OF CURRENT INTEREST

Edward P. Burch Dies

Edward Parris Burch, retired consulting engineer, Minneapolis, Minn., died May 4, 1945. Mr. Burch was born on August 20, 1870, in Spring Brook, Wis., and was graduated from the University of Minnesota in 1892. Following his graduation he became engineer of power for the Twin City Rapid Transit Company, Minneapolis and St. Paul, Minn., and remained in that position until 1900 when he became a consulting engineer. In the latter capacity, Mr. Burch laid the first high-voltage underground cable installed in the United States (13,000 volts) and, in 1898, had charge of the installation of electric machinery for a 10,000-horsepower-capacity hydraulic plant at St. Anthony's Falls on the Mississippi River. From 1899 until his retirement in 1936, he was active as a consulting engineer throughout the nation, specializing in electric-traction and evaluation problems.

Mr. Burch was a charter member and past chairman of the Minnesota Section of the AIEE of which he was a local member at the time of his death. He was the author of two books, "Electric Traction for Railway Trains" and "Telephone Rates in Detroit."

Foreign Scientists Barred From Practice in Mexico

Foreign members of the scientific professions have been excluded from practicing in Mexico by the provisions of a recent law which sets up standards and conditions of practice for the professions.

A few exceptions have been made on a temporary basis for persons whose services cannot be replaced easily. The only foreigners thus exempt from the law must:

1. Be professors of specialties still not taught or display unquestionable and outstanding competence in the opinion of the General Bureau of Professions.

2. Be consultants or instructors dedicated to the establishment, organization, or installations of institutions of public or military instruction, laboratories, or institutes of essentially scientific character.

3. Be technical directors in the development of the country's natural resources.

WAR PROGRAM • •

Dummy Head Tests Heating Pads for Oxygen Masks

An automatic breathing head which has a wooden skeletal structure and dermis and epidermis layers of synthetic rubber between which hair-thin electric heating wires are wrapped around the forehead and over the nose and cheeks has been developed by the General Electric Company and the Air Technical Service Command, Wright Field, Dayton, Ohio. The head was built to aid in the testing of small close-fitting blankets for oxygen masks worn in substratosphere temperatures. The moisture in the aviator's breath often forms ice inside the mask thus endangering the oxygen supply.

During the testing, the dummy head is placed in a cold chamber and operated from a cabinet in an adjacent room. A cable containing 62 wires connects cabinet and head. The cabinet contains a bellows designed by the Aero Medical Laboratory to operate a heart-shaped cam which gives the pause in the breathing pattern. By changing cam sizes, breathing rates can be changed. A "breathing orifice selector," set in the base of the head gives five choices of inhalation and exhalation rates through the nose or mouth or both. A slight suction is produced in the mouth and nostrils by the control bellows. The regulator responds, and oxygen is fed to the head through the orifice selector and through a tube to an adjustable heater which raises the temperature as in human respiratory passages. On the exhalation stroke, the oxygen is forced from the bellows through a humidifier which feeds it with water. A "dehumidifier heater" in the base of the head makes adjustment of the amount of moisture in the exhaled breath possible.

First attempts at breathing-head construction failed because the fine wires broke down under repeated adjustment of the masks. Finally the straight wire was replaced with spiraled-wire construction, an innovation which will result in greatly improved electrically heated blankets and similar household equipment. This new wire, now used in garments and blankets for the Army Air Forces, has a flexing life more than ten times that of the straight wire formerly used in electric blankets.

Parallel Generator Operation for Bomber Power Systems

Parallel operation of 400-cycle a-c aircraft generators under conditions simulating combat emergencies was demonstrated recently to representatives of the Army Air Forces at the General Electric Company, Schenectady, N. Y. Engineers of the company say that the new parallel arrangement will prevent any of the remotely controlled machine-gun turrets from being knocked out of action owing to loss of an engine. In effect, paralleling permits the airplane's generators to replace one another instantaneously and automatically. Thus, power supply to all of the electrically operated turrets is continuous, even though part of the system is put out of commission.

Parallel operation of the generators required the development of a new high-speed governor capable of holding frequency and dividing the power load equally among engines operating at different speeds. The new governor is described as an electromagnetically actuated pilot valve operating a hydraulic servo mechanism.

Success of the parallel generator operation permits the use of an a-c system throughout the airplane. Problems of commutation and brushwear at high altitudes are minimized with the a-c system.

In the demonstration two 400-cycle 30-kw 40-kva aircraft alternators were used. Each alternator was driven by a 450-horsepower aircraft engine through Sundstrand variable-ratio drives governed to maintain synchronism and equal-load division in spite of imposed variations in engine speed. A special air cap over the exciter end of each alternator provided cooling air for the ground test, substituting for rammed air. A gearbox arrangement was used to simulate the step-up gear for the accessory drive employed on an actual aircraft-engine installation.

Robot Cuts Pilot's Duties

An "automatic engineer" for aircraft powerplants, which combines three engine-control operations into one and simplifies the job of the fighter pilot allowing him more time for fighting, has been announced by the General Electric Company, Schenectady, N. Y. This system used in connection with the turbosupercharged engine, sets the throttle, engine-speed control, and the manifold-pressure regulator. The automatic engineer is responsible for maintaining constant-power output as the airplane ascends by adjusting the turbocharger which compensates for the greater difficulty of engine operation in rarefied atmospheres. By reducing the human equation a more uniform and efficient performance of the power plant is obtained. At extremely high altitudes or after battle damage the unit also limits the maximum operating speed of the turbosupercharger to a safe value. The amount of linkage and cables otherwise required also is reduced. When necessary during long flights, the pilot may take control and regulate manifold pressure and engine speed separately.

Field-Wire Circuits Strung From Airplane

A method of laying communication wire by airplane originally developed for light combat wire now has been perfected for the heavier standard field wire by Bell Telephone Laboratories, Inc., at the request of the Air Technical Service Command.

It has been demonstrated in tests that the new plastic-insulated wire or the heavier wire which is standard with the American and British Armies can be paid out from a *C*-47 transport airplane at speeds up to 250 feet a second. One or two miles of wire are packed in criss-cross coils which are easily handled and offer the advantage that two layers of wire cannot be started at the same time during the unwinding process. In wire-laying operations the coils are lined up in echelon from the open doorway of the airplane to the forward end of the cargo space, secured to the floor, and the outside end of the first coil is spliced to the inside end of the

Interior of a C-47 transport airplane with field-wire coils ready for trial run

one behind. The inside end of the first coil is led outside the airplane through a pipe six inches in diameter, brought back into the cargo space, and attached to a parachute. The parachute is thrown out to a ground party at the starting point. Eventually the other end of the wire pulls free of the airplane and is picked up by a ground party at the end of the communication line.

Film Depicts Japanese Strategy. Captured Japanese movies, animated maps, and combat pictures are combined in the latest Navy motion picture, "The Admiral's Reply," made available by the Navy's industrial incentive division for war-plant and labor-union showing. Narrated by Rear Admiral DeWitt C. Ramsey, chief of the Navy's Bureau of Aeronautics, the picture presents the enemy as rich in natural resources and man power, fighting a religious war, and planning a delaying action in the hope the Allies will tire of the war. Facts on the size of the Japanese army and air force and on the Japanese soldier's fighting fanaticism are illustrated pictorially.

INDUSTRY . . . . .

FPC Approves Mergers

The Federal Power Commission has approved the merger of the facilities of the Wachusett Electric Company, the Leominster Electric Light and Power Company, and the Middlesex County Electric Company, all of Massachusetts. As a result of the merger, the Wachusett Company will acquire all the operating facilities, own all the assets, and assume all the liabilities of the Leominster and Middlesex companies.

The FPC also has approved the merger of the Worcester Suburban Electric Company, the Milford Electric Light and Power Company, and the Union Light and Power Company, all Massachusetts companies. The Worcester Company will take over the operating facilities, assets, and liabilities of the other two companies. The territories served by these companies are contiguous, and all three purchase their energy requirements from the New England Power Company, an associate company.

Plastic Lens Provide Larger Television Images

With the use of a plastic lens, a television receiver is scheduled for the postwar home which will project an image five times as large as that obtainable with prewar models. The new lens, made from Lucite manufactured by the E. I. Du Pont de Nemours and Company, Inc., can be molded to the required optical curvature within a few minutes. It replaces the expensive glass lens which took days to grind and polish.

The lens is part of a projecting system employing the optical principle of the Schmidt astronomical camera, but, with its adaptation for short-distance projection and the low cost entailed by molding the aspherical correcting lens from clear plastic, it now can be incorporated in a television set for home use. In the application of the astronomical-camera principle for television, the spherical mirror collects light from the image produced on the face of the cathode-ray tube and enlarges it to a 16-by-21-inch picture on the viewing screen. For theater projection images as large as 15 by 20 feet may be produced.

In the model developed by the RCA Victor division of the Radio Corporation of America, the plastic correcting lens has a hole in the center and is placed around the neck of the cathode-ray tube so that the image from the spherical mirror is corrected before it strikes an inclined flat mirror near the top of the receiver cabinet. The picture then is thrown onto a translucent vertical screen mounted in front of the cabinet.

Automatic Plotting Developed

An electrically operated recording densitometer which automatically computes a true logarithmic graph of its findings has been developed for use in any investigation where variations in the subject can be detected by electronics. It is of particular value for the detection of variations in photographic or radiographic film. The instrument completes in 30 seconds a permanent curve that formerly required a number of individual hand operations. Thus, not only is much labor saved; but a more accurate graphical representation of the data is made possible. The densitometer was designed and built by the Western Electric Company and the Leeds and Northrup Company for Triplett and Barton, Inc., Burbank, Calif.

Canadian Radio Market Estimated. An immediate market for only 135,000 home radio sets was estimated from a survey recently conducted by Canadian Facts, Ltd., for the Radio Manufacturers Association of Canada. Of these 65 per cent would be a-c models, 20 per cent combination models, and 15 per cent battery sets. Although 42 per cent of the persons interviewed plan to buy a new set after the war, only five per cent will buy sets as soon as they are avai able. Other facts revealed by the survey were:

Nine out of ten families now own a radio set, and one out of ten has more than one radio.

Five per cent of all sets now owned are out of order.

Radios rank after automobiles and refrigerators on the Canadian family's list of prospective purchases.

Combination sets elicit the most interest with tone the first consideration and price second.

Only one person in ten has heard of frequency modulation.

New Windings for Motors. A three-horsepower winding for a 1½-horsepower frame has been designed which will permit drill-press motors to withstand constant overloading, often in excess of five horsepower, without failure. According to L. G. Young, shop superintendent of the Arthur H. Wagner Company, Chicago, Ill., designers of the winding, the use of Fiberglas insulation throughout the rewound motors enables them to withstand the high temperatures induced by constant overloading. The motors formerly used were 1½ horsepower cotton-insulated.

Eye-Protection Program Initiated. A research program intended to provide information to be used in combating the many thousand eye injuries that occur annually in American industry has been initiated at Battelle Institute, Columbus, Ohio, under the sponsorship of the American Society of Safety

Engineers, engineering section of the National Safety Council. The investigation, both laboratory and statistical, will apply particularly to the evaluation of the performance requirements and specifications of satisfactory plastic eye protectors.

Publicity for Patentees' Licensing. A register of patents available for licensing has been established in the United States Patent Office, and regular lists of such patents will be published in the *Official Gazette of the Patent Office*. The purpose of the new service, initiated by the Patent Office at the direction of Secretary of Commerce Henry Wallace, is to bring to national attention patents under which the owners are willing to grant licenses. It is hoped that such information will lead to greater employment opportunities during reconversion.

Square D Plant for Mexico. Formation of Square D de Mexico for the manufacture of electric distributing and control equipment for the Mexican market is in process of completion, F. W. Magin, president, the Square D Company, Detroit, Mich., announced recently. Square D de Mexico will be owned jointly by the United States company and Mexican industrialists who are experienced in Mexican electrical requirements, Mr. Magin said, and the plant will be built in Mexico City, Federal District, as soon as arrangements can be completed.

Slide Rule for Resistance, Capacitance. A parallel-resistance and series-capacitance calculator, a slide-rule device designed to provide a rapid and accurate means of determining the reciprocal of the sum of two reciprocals, has been released by the Allied Radio Corporation, Chicago, Ill. This calculator indicates in one setting the numerous pairs of resistances which may be connected in parallel, or capacitances in series, to provide any required resistance or capacitance value. The capacitance and resistance figures on the face of the rule also can represent inductance, impedance, reactance, or other units which can be handled in a similar manner.

Television Station Planned. An experimental television station, W2XDK, is scheduled for construction by the Sherron Electronics Company, Brooklyn, N. Y., following the recent granting of a permit by the Federal Communications Commission.

Film Pictures Distortion in Welding. A motion picture in sound and color, "Prevention and Control of Distortion in Arc Welding," has been made available to schools, colleges, technical societies, factories, shipyards, and industrial groups by the Lincoln Electric Company, Cleveland, Ohio. The film, produced by the Walt Disney Productions, prescribes three simple rules for thwarting "Mr. Shrink":

1. Reduce the effective shrinking force.
2. Make shrinkage forces work to minimize distortion.
3. Balance shrinkage forces with other forces.

POSTWAR• • • • • •

Bretton Woods Benefits Electronics Industry, Says Committee

Because the electronics industry underwent a tremendous expansion between 1941 and the present, it will be subject to special reconversion difficulties and will profit particularly from the stabilizing effect of the Bretton Woods agreements, according to a recent report on the "Electronics Industry and Bretton Woods," issued by the Business and Industry Committee for Bretton Woods of which Ralph E. Flanders of the Jones and Lamson Machine Company is chairman. Competitive pressures from within and without will be lessened by the operation of the International Monetary Fund and the International Bank for Reconstruction and Development which were proposed at Bretton Woods, the committee states. The enormity of the electronics industry's problem is reflected in the rise in the dollar value of its output which was $300,000,000 from 1939 to 1941 and is $4,600,000,000 at present.

In analyzing the precarious position of the electronics industry, the report points out that the electronics industry must sell to a consuming and industrial public which is uninformed and unprepared. The industry itself is uncertain about the peacetime use of its products, many of which are strictly military products with only five per cent directly applicable to peacetime needs. Industry sources are quoted as expecting postwar production to equal only $800,000,000 to $1,000,000,000. The prospect of achieving an inevitable contraction on an orderly basis is complicated by the fact that 1,200 firms now have mushroomed from the 400 to 500 operating before the war. Furthermore, the industry's external competitive position will be injured by the fact that the war demand for electronics equipment will be maintained for some time after other industries have begun reconversion. This means electronics will be a tardy competitor for the peacetime dollar.

The electronics industry stands to gain directly in any expansion of foreign markets for United States exports effected by the proposed Fund and Bank, as well as from the stable domestic market accompanying the general prosperity stimulated by expanded foreign trade, the report declares. In the committee's opinion foreign markets offer an important area for electronics sales even in the immediate postwar period, and it is now expected that improved models will be available for export sooner than the models designed for the domestic market. Many of the Latin American countries are ripe for the development of their radio markets. A recent study of the situation in Argentina by the Department of Commerce reported very favorably on potential consumption of radio equipment and parts from the United States. The industrial development which will be undertaken by these countries, and the reconstruction projects of Europe and Asia also will create what should be an important market for the electronics industry. It will be much easier to sell electronics equipment when new investment for reconstruction and reconversion must be undertaken, than it will be to induce firms to replace expensive equipment at a later time. These early purchases, moreover, will establish the replacement and maintenance market for many years to come.

How quickly new devices will be introduced, the report designates as the most important question for the future of the industry. The wartime growth of knowledge and experience in electronics will help, but the full potentialities of the market can be realized only in a prosperous and expanding economy. American industry will replace existing machinery with new electronic equipment, only if the market for its products is growing. A sharp industrial contraction will reduce the interest of American business in new and expensive electronics products. Similarly, electronics can speed up and cheapen the production of airplanes, helicopters, and prefabricated houses for consumers, but the demand for these products can be created only by jobs and prosperity, the committee warns.

In the immediate postwar years, prosperity in the United States will depend in part on the expansion of its foreign markets and the revival of world trade. Foreign countries are anxious to buy commodities, but without financial assistance they will be unable to do so. The International Bank and Fund will provide the necessary assistance by making it possible for countries to achieve a better balance in their international payments position and by working to remove the restrictive monetary policies which curtailed world trade in the past. The International Bank also will assist European countries to obtain special credits for the reconstruction and development job which must be done. It will help them to buy electronics equipment directly, and it will help them to buy the iron and steel and prefabricated houses which will create a demand for electronics equipment within the United States, according to the committee's summary.

College Presidents Polled on Universal Military Training

A survey of the reactions of college and university administrators and professors to universal military training has revealed that about one half of those questioned are against the institution of such a program. This conclusion is the result of 1,196 replies to a questionnaire prepared by the American Council on Education, the American Association of Junior Colleges, and the American Association of University Professors, and sent by the former two organizations to 1,685 college, university, and junior-college presidents.

Of those questioned, 77.1 per cent believed that the decision regarding the establishment of peacetime military training for the United States should be deferred until the establishment of peace. Replies also indicated that 80.1 per cent favored the creation of a national commission representative of many interests—Army and Navy, education, business, labor, agriculture, and religion—to study all aspects of postwar military training and to make recommendations to Congress. However, 47 per cent of the questionnaire recipients definitely were opposed to the establishment of universal military training as a peacetime policy, as compared with 38.3 per cent who were in favor of it. The others were uncertain or would not commit themselves.

Railroad Abandons Steam for Diesel Locomotives

A postwar conversion from steam to Diesel-electric locomotives will be started immediately by the New York, Ontario, and Western Railway, according to Raymond L. Gebhardt and Ferdinand J. Sieghardt, trustees. It is estimated that complete replacement of steam by Diesel-electric power would result in operating economies of $1,000,000 a year.

The New York, Ontario, and Western Railway has about 550 miles of main line, much of it with many curves and steep grades, and it is under these conditions that Diesel-electric power operates at the greatest advantage compared with steam. Abandonment of unprofitable branch lines and conversion of 110 miles of double-track main line to single track also are expected to contribute to the anticipated saving.

OTHER SOCIETIES

ASME Holds Aviation Conference. New aircraft techniques and a projection of postwar plans for the industry were the business of the 16 sessions which comprised the Aviation War Conference of the American Society of Mechanical Engineers held at the University of California, Los Angeles, June 11–14. The four-day conference was under the auspices of the Southern California section of the society, and attendance of persons requiring train or hotel reservations was discouraged. Among the speakers scheduled for the opening session were: Clarence A. Dykstra, provost of the University of California; M. J. Zucrow, executive engineer, Aeroject Engineering Corporation, Azusa, Calif., whose topic was "Jet-Propulsion Principles and Rockets for Assisted Take-Off"; and Colonel Homer Boushey, Bakersfield (Calif.) Army Air Field, who discussed "Jet-Propelled Airplanes." In all, 38 papers were presented during the conference.

Meeting of the American Physical Society. The 266th meeting of the American Physical Society was held at Ohio State University, Columbus, June 15–16, 1945, with limited attendance. The second annual meeting of the society's division of electron and ion optics, and a group of invited papers on biophysics were included in the program. Sessions on spectroscopy and nuclear physics also were held. Priority of attendance was given to authors of papers by the society, which made reservations for only 50 members not from the local commuting zone.

George Seabury Dies; William N. Carey Succeeds Him

George T. Seabury, secretary of the American Society of Civil Engineers since 1925, whose retirement would have become effective June 1, died May 25, 1945. It was under his direction that the ASCE membership grew from about 11,000 to nearly 21,000 and *Civil Engineering*, which featured reports on works in progress in a more popular vein, was established as a monthly publication.

At the beginning of the century Mr. Seabury, who was graduated from the Massachusetts Institute of Technology in 1902, worked on the Catskill water supply for the City of New York and on the water supply for Providence, R. I. During World War I he served as major in the United States Quartermaster Corps and afterwards formed his own company to engage in general construction work. Before his death Mr. Seabury had accepted an appointment as assistant to the president of the ASCE, a new post.

Colonel William N. Carey, former consulting engineer of St. Paul, Minn., recently on active duty as chief engineer of the Federal Works Agency, has been named new secretary of the ASCE. A native of St. Paul, Colonel Carey attended the University of Minnesota. He served on the Western Front as a major in the Corps of Engineers in World War I. During the present war he served for a year in the Jacksonville, Fla., United States Engineer District in charge of design of Army airdromes and camps. In 1942 he was transferred to the FWA in Washington, D. C., as chief engineer. Between wars Colonel Carey was occupied variously as partner in a consulting engineering firm, city engineer of St. Paul, and state engineer for the Public Works Administration. He supervised for the Government the design and construction of the $17,000,000 sewerage and sewage-treatment project of the Minneapolis–St. Paul Sanitary District. He has been an ASCE member since 1916 and has held several society offices.

RESEARCH

New Laboratory Designed by General Electric Company

Erection of a new $8,000,000 building for the General Electric Company's research laboratory, which will afford some 50 per cent more space than present facilities, has been announced by Charles E. Wilson, president of the company.

As planned the new laboratory anticipates the immediate postwar expansion of the staff from about 540 to 800 persons, and the probable needs of the next 15 or 20 years. Provision has been made for space to build special-purpose structures, as well as for a central building with ample grounds for additions on a 219-acre estate in Niskayuna, near Schenectady, N. Y.

The new building will be T-shaped and will vary from two to five stories in height with 200,000 square feet of laboratory working space, an auditorium seating 300, a dining room, and conference rooms. One third of the laboratory space will be devoted to service facilities, machine shops, and specialty shops. Walls between rooms will be movable, capable of being placed at 18-inch intervals, so that rooms may be made larger or smaller. Benches and furnishings will be standardized, so that they can be shifted from place to place. The building will be air-conditioned throughout, and wires and pipes carrying various voltages of electricity, compressed-air suction, illuminating gas, hydrogen, and oxygen will be so placed that they can be brought into any room.

JOINT ACTIVITIES

Bureau of Standards Issues Lightning Handbook

Handbook *H*40, illustrated latest edition of the *Code for Protection against Lightning*, has been issued by the National Bureau of Standards, United States Department of Commerce. The Lightning Code is sponsored by the Bureau of Standards in co-operation with the AIEE under the procedures of the American Standards Association.

Part 1 of Handbook *H*40 deals with the protection of persons, while part 2 concerns the protection of buildings and sets up standards for adequate rodding of such structures. The third part of the publication covers structures containing flammable liquids. Because of developments during the past seven years, this portion of the code has been revised by a representative committee headed by W. W. Lewis (F '38) of the General Electric Company, Schenectady, N. Y., and now contains a number of modern methods for protecting oil refineries, tank farms, and the like. Copies may be purchased for 20 cents each from the Superintendent of Documents, Washington 25, D. C.

LETTERS TO THE EDITOR

INSTITUTE members and subscribers are invited to contribute to these columns expressions of opinion dealing with published articles, technical papers, or other subjects of general professional interest. While endeavoring to publish as many letters as possible, Electrical Engineering reserves the right to publish them in whole or in part or to reject them entirely. Statements in letters are expressly understood to be made by the writers. Publication here in no wise constitutes endorsement or recognition by the AIEE. All letters submitted for publication should be typewritten, double-spaced, not carbon copies. Any illustrations should be submitted in duplicate, one copy an inked drawing without lettering, the other lettered. Captions should be supplied for all illustrations.

Edwards Perpetual Calendar

To the Editor:

A member of the AIEE and also a member of the World Calendar Association wrote us a letter relating to an article appearing in the April 1945 issue of *Electrical Engineering* which dealt entirely with the proposed Edwards Perpetual Calendar. The writer suggested that the editor should give equal space to the World Calendar of 12 months and equal quarters, which is every year the

same and which begins every year with Sunday, the first day of the week.

For the information of your readers I should like to mention certain facts in connection with the proposed Edwards Perpetual Calendar.

In arrangement it is identical to the one by Professor L. A. Grosclaude that was published in Switzerland in March 1900. This plan was definitely rejected by the official Swiss Committee on Calendar Reform. The plan, now known as the World Calendar, received official recognition by the Swiss Government in June 1931.

The great drawback of the Grosclaude Calendar was the beginning of the year on a Monday, and designating Monday as the first day of the week, which is contrary to history and custom. And this same drawback also appears in the Edwards Calendar.

In 1937 the League of Nations submitted to its member and nonmember States the Chilean draft resolution for the World Calendar and thereby eliminated all the other previously submitted plans.

The perpetual World Calendar of 12 months and equal quarters has received the approval of 14 nations (Afghanistan, Brazil, Chile, China, Estonia, Greece, Hungary, Mexico, Norway, Panama, Peru, Spain, Turkey, and Uruguay). Many organizations have endorsed it among them—the Chicago Association, New York State, Pittsburgh, and St. Louis Chambers of Commerce, and the London, British, and Empire Chambers of Commerce. *Influential scientists*, mentioning but a few are—Robert A. Millikan, Sir H. Spencer-Jones, and Harlan T. Stetson; *educators*—John Dewey, Dugald C. Jackson, William Allan Neilson; *leading men and women*—James Truslow Adams, Carrie Chapman Catt, Ira A. Hirschmann, Isadore Lubin, Minnie L. Maffett, Helen McKinstry, Julius F. Stone, Gerard Swope, Mary E. Woolley.

Let me quote from Commodore J. F. Hellweg, United States Navy retired, superintendent of the United States Naval Observatory in Washington, D. C.:

"My advice to all advocates of calendar revision is to devote their energies to the only proposal which meets all the requirements of the situation with a minimum of upheaval and disturbance and a maximum of benefits to mankind—the world calendar."

ELISABETH ACHELIS

(President, World Calendar Association, New York, N. Y.)

To the Editor:

The World Calendar was rejected by the League of Nations in 1931, and, after the World Calendar Association and its members again promoted its reconsideration in 1937, the draft was submitted to all member and nonmember States by the League. Forty-five replies were received of which only 14 accepted the draft. The others politely rejected it or made no observations, the United States was noncommittal, the Vatican remained aloof, and the League of Nations definitely put the World Calendar aside.

Of previous endorsers of the World Calendar Sir H. Spencer-Jones, the Astronomer Royal, regards a plan similar to mine (30, 30, 31 day months and the year, the quarter, and the week starting on a Monday) as "probably the simplest and with the most to recommend it." The statement by Captain J. F. Hellweg was made in 1933, before the Edwards Calendar was publicized.

My plan has not been rejected and is not identical to any other previously rejected plan. The Swiss claim no monopoly on calendar revision, nor do they have nor claim any authority to lead the world on this subject. From my study of calendar history I find that hundreds of new calendars have been proposed in the past. Two of these are similar to the Perpetual Calendar but are not identical. The Grosclaude plan began the year with Monday, January 1, had a "leap day" in the middle of the year, and an annual "blank day" for the 365th day. Another and earlier plan began the year on Monday, January 1, had an annual "blank day" in the middle of the year, and a "leap day" at the end of the year. The Edwards Perpetual Calendar begins the year on a "second Sunday," which is New Year's Day, and Monday, January 1, is the second day of the year. Leap Year Day is the first day of the second half year in leap years, and the 365th day is December 31, as at present.

These differences are really important ones inasmuch as they are some of the reasons why the Perpetual Calendar is considered practical, simple, and up-to-date, whereas other proposals have been rejected as being impractical and confusing.

The first day of the year, New Year's Day an already well-known holiday, as an international civil holiday in the business world, is the most logical day to consider as a day apart. Then 364 days, evenly divisible into equal quarters and whole weeks, follow without any confusing "blank day," December *Y*. December *W*, Year End Day, or a "Sylvester" at the end of the year. The Edwards Perpetual Calender year will end normally with December 31, as at present.

Leap Year Day as the 184th day in leap years is the most logical place for this "day apart" also. It will provide a summer holiday for the vast majority of the world's population, and, as the first day of the second half year, it will balance New Year's Day exactly for comparison purposes.

The 30, 30, 31 day arrangement is most practical, since it not only allows the quarter months to start on the significant and easily remembered business days of Monday, Wednesday, and Friday, but also allows the 91st day of each quarter to fall on a most appropriate day for quarter-end accounting. Since this civil calendar is proposed primarily for world-wide business reasons, this arrangement is most logical.

As for the week beginning on Monday, this has been the *custom* for many years and is the reason why so many calendars have been proposed this way. Saturday and Sunday long have been known and considered as the weekend. Many minds have thought it would be honest so to show it on the calendar, and many calendars, diaries, and account books have been printed with Sunday as the seventh day of the week. The majority of schools, colleges, and business institutions consider Monday as the first day of the week, and the majority of clergymen think of their Sunday sermons and services as concluding a week's work of preparation. Monday begins a new work week for them. Only a few people have objected to showing Monday on the calendar as the first day of the week, and Sunday as the seventh.

It makes no difference whether worship is held on a day called Saturday or Sunday or any other name. As one editor so ably put it:

"The calendar is simply an invention of man. It was not created by any higher being, and it is no more sacred than the practice of dividing each day into twenty-four hours."

Nearly all the individual days of the week are sacred to some man-devised method of religious observance. There are hundreds of various religions, possibly thousands, and it would be utterly impossible to devise a religious calendar that would satisfy half of them.

The Perpetual Calendar is proposed as a practical up-to-date civil calendar, based on present day facts and customs. It is a simple sensible method of accounting for our days and for the vast work of the world. It has none of the monotony and indivisibility of the 13-month plan, it is free from the bogey of Friday the 13th, and it has 26 work days, plus sabbaths, in every month of the year. It would benefit both industry and labor, and all that is needed is to overcome human inertia and continually to request the adoption of the Perpetual Calendar until we have it.

W. E. EDWARDS

Lieutenant, United States Naval Reserve, Radar Maintenance School, Navy Yard 128, c/o F.P.O., San Francisco, Calif.)

State of the Art of Circuit-Breaker Application

To the Editor:

Adequate circuit-breaker application has lagged in many fields, particularly for industrial use. It often has been difficult to convince the holders of the purse strings of the value of sound electrical practice. There is evidence, however, that industrial management is awakening to the importance of this subject. The situation potentially presents a huge backlog of business to the circuit-breaker manufacturers. It is unfortunate, therefore, that there should be certain trends in the design and application of circuit breakers which will place an unnecessary burden on many users and may stifle this new interest in better electric equipment.

These trends are exhibited in an emphasis on fast circuit-breaker operation, and application on the basis of interrupting rating, with the mechanical (short-time) rating playing a subordinate role. This is satisfactory for central-station practice, particularly in the case of the larger circuit breakers. But in the industrial field, and even for many utility installations, blind subservience to this policy often results in the use of much larger and more expensive circuit breakers than necessary. An intelligent application of available circuit breakers often will effect substantial savings, whereas certain changes in design would make further economies possible. Suitable talent for adequate analysis often is not available to the industrial user within his own personnel, and he does not always consider himself justified in employing outside consulting service.

Fast circuit-breaker operation is not a universal necessity. Sometimes it is undesirable. The mechanical rating then becomes the important factor and may be the dominating one. Under these circumstances a wide

spread between the ampere values for the mechanical rating and the maximum interrupting rating is desirable for optimum circuit-breaker application. But for most power circuit breakers (for use above 600 volts) now on the market the ratio between these two ratings is in the range of only about 1.6 to 1, whereas for the 600-volt class air circuit breakers it is only one to one. The latest National Electrical Manufacturers Association recommendations on circuit-breaker application, now endorsed by certain leading manufacturers, completely disregard these possibilities. These recommendations are undoubtedly an attempt to simplify application procedure, but it is believed that they obscure important features and reduce the procedure to a rule-of-thumb process. Certainly they do not guide the prospective industrial user without a fully staffed electrical department to a more favorable analysis of his problem.

In the power circuit-breaker field, medium voltages of about 2,300 volts are common for service and plant distribution purposes in a wide range of sizes of industrial plants. These cases often involve large concentrations of power from utility sources or their own generating equipment. In plants of this kind co-ordination of circuit-breaker operation usually requires timing sequences which bear no strict relation to interrupting ratings, with the larger and more expensive circuit breakers carrying the longer timings. These timing sequences need not interfere with circuit-breaker co-ordination in the utility system, because modern relay practices permit of sectionalizing to such an extent that full protection can be accomplished practically independent of external faults. Furthermore, many utility systems are so large that faults beyond customer services frequently are felt as only slight overloads.

On the users' premises, then, full latitude should be possible in these cases for an economical application of circuit breakers. But no matter how the designer tries to take advantage of reduced interrupting duties by means of his timing sequence, the mechanical rating of the circuit breaker interposes an insurmountable obstacle. Plants with large connected-motor loads present unusually severe cases. There is a notable gap in available circuit breakers for this range of service. The line of both air and oil circuit breakers reasonably suited for industrial use stops at about 37,000 amperes for the interrupting rating and about 60,000 amperes for the mechanical rating. If either requirement is above these limits, it is necessary to use a much more expensive circuit breaker or to install fault-limiting equipment. Either choice represents an expense. It is obvious that with a higher mechanical rating the smaller circuit breakers could be used more nearly up to their interrupting rating. A ratio of three to one or even higher between the mechanical and maximum interrupting ratings would be most helpful.

In the case of air circuit breakers for use on 600 volts and below, the situation is similar but of a somewhat different nature. These circuit breakers are applied widely close to power consuming machinery, where fast operation is desirable. Some plants require a large number of these circuit breakers of small individual continuous current rating. In the interest of economy circuit breakers of reasonably small size are dictated. But the short-circuit duty is often above the rating of these circuit breakers. To meet this situation the expedient of cascading is utilized, by which a circuit breaker of larger interrupting capacity backs up a group of smaller circuit breakers and opens the circuit after one of the latter has begun to open the circuit but before it has cleared the arc. But cascading is only a makeshift and places the manufacturer in the position of recommending the use of his equipment beyond its rating. For it is to be noted that the short-time (mechanical) ratings of these circuit breakers are identical with the interrupting ratings. Therefore, wherever these circuit breakers must be backed up for interrupting duty, they are being applied beyond their mechanical rating. A ratio of about two to one or three to one between the mechanical and interrupting ratings of these circuit breakers seems to be indicated, or the mechanical rating should be equal to the interrupting rating of the next or second larger size circuit breaker.

It is proposed that the manufacturers initiate a program of increased mechanical ratings for circuit breakers of small and medium size. Some immediate relief may be possible by a rerating of existing designs. Beyond this, it might be asking a large order, involving increased cost of some circuit breakers. But it seems a worth-while cause if smaller circuit breakers can be used. The past emphasis has been on improved interrupting performance, and the designers have done an excellent job in that regard. Here is a new challenge to them.

WILLIAM A. TRIPP

(Electrical engineer, Charles T. Main, Inc., Boston Mass.)

NEW BOOKS

The following new books are among those recently received from the publishers. Books designated ESL are available at the Engineering Societies Library; these and thousands of other technical books may be borrowed from the library by mail by AIEE members. The Institute assumes no responsibility for statements made in the following summaries, information for which is taken from the prefaces of the books. All inquiries relating to the purchase of any book reviewed in these columns should be addressed to the publisher of the book in question.

ASTM Standards 1944 Including Tentative Standards (a triennial publication). Part 1, Metals, 2,047 pages; part 2, Nonmetallic Materials—Constructional, 1,649 pages; part 3, Nonmetallic Materials—General, 2,202 pages. American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa., 1944–45. Illustrated, 9¼ by 6 inches, cloth, $10 per volume. (ESL.)

This new edition of ASTM Standards contains 1,235 specifications and standard methods, including both formal and tentative ones. It also includes the emergency standards and alternate provisions adopted because of wartime conditions. The work appears in three volumes. Each part has an index and may be purchased separately.

Builders of the Bridge. By D. B. Steinman. Harcourt, Brace and Company, New York, N. Y., 1945. 457 pages, illustrated, 8¼ by 5¼ inches, cloth, $3.50. (ESL.)

This interesting contribution to the history of bridge building covers the careers of two great engineers of the 19th century. Emigrating to America in 1831, the elder Roebli soon began his engineering life as a railroa surveyor. This was followed by the man facture of wire rope, for the first time America. Soon, however, he turned to su pension bridges, the field in which he and h son became famous. Doctor Steinman d scribes the bridges built at Pittsburg Niagara, and Cincinnati, and finally th construction of the Brooklyn Bridge. Th last is dealt with in detail. The story is dramatic one, of interest to laymen as we as engineers.

New Architecture and City Planning. symposium edited by P. Zucker. Philo sophical Library, 15 East 40th Street, Ne York, N. Y., 1944. 694 pages, illustrate 9 by 6 inches, cloth, $10. (ESL.)

This symposium represents realistic sug gestions for the future of architecture an city planning by leading American author ties. The several sections deal, respectively with specific building types, new materia and new construction methods, housing, cit and regional planning, monumentality i architecture, and the education of citize interest in the foregoing topics. The socia requirements and implications of the variou problems are brought out as well as the purel technical aspects.

Photomicrography. 14th edition. East man Kodak Company, Rochester, N. Y. 1944. 174 pages, illustrated, 8¾ by 5¾ inches, cloth, $2. (ESL.)

Beginning with description of the neces sary apparatus and general optical principle this small book surveys the process of photog raphy through a microscope in considerabl detail. The special techniques for motio photomicrography and color photomicrog raphy are explained, and a selected bibliog raphy is appended.

PAMPHLETS

The following recently issued pamphlets may b of interest to readers of "Electrical Engineering." All inquiries should be addressed to the issuer:

Resin Coatings Baked by Induction Heating. By A. P. Mazzucchelli, R. E. Nicolson Bakelite Corporation, 30 East 42d Street New York 17, N. Y., 10 pages.

Industrial Property Records for Accounting and Valuation Uses. C. V. Armstrong Iowa Engineering Experiment Station, Ames Iowa, 96 pages, no charge.

Erie Railroad—Its Beginnings. By Rober E. Woodruff. The Newcomen Society o England, American Branch, New York, N. Y 24 pages.

A Story of Private Industry That Should Be Told. By Tom P. Walker. *Public Utilities Fortnightly*, Washington, D. C., 11 pages.

National Apprenticeship and Training Standards for the Electrical Industry. Bureau of Training, War Manpower Commission, Washington, D. C., 32 pages.

Induction Heating—A History of Its Development. By Frank T. Chesnut. Aja Electrothermic Corporation, Trenton N. J.